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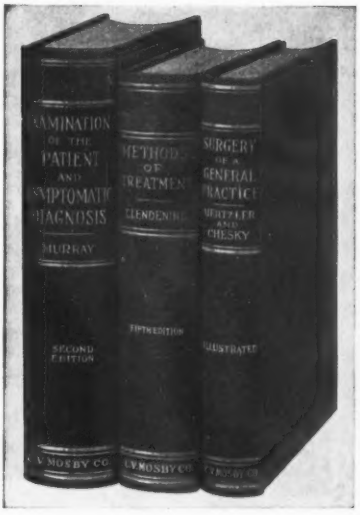

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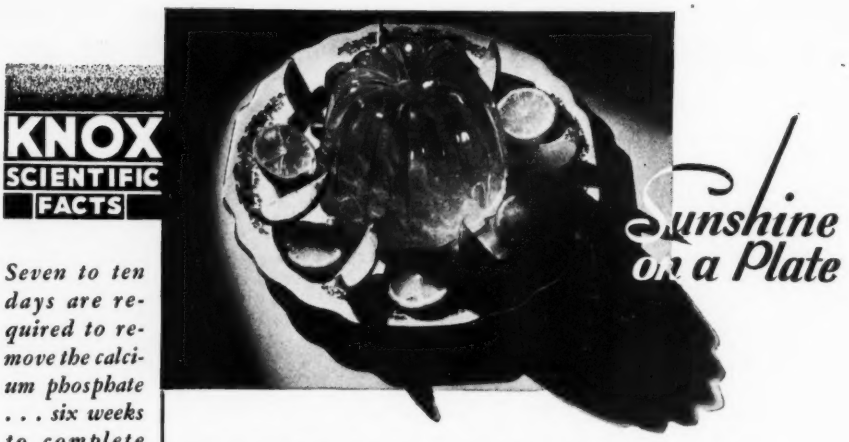

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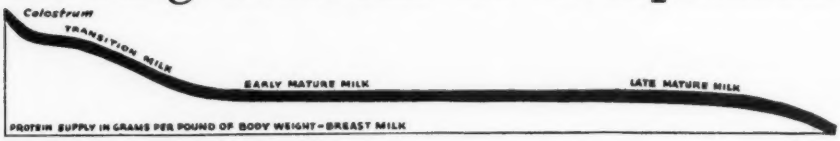

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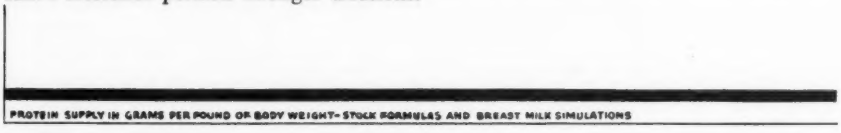

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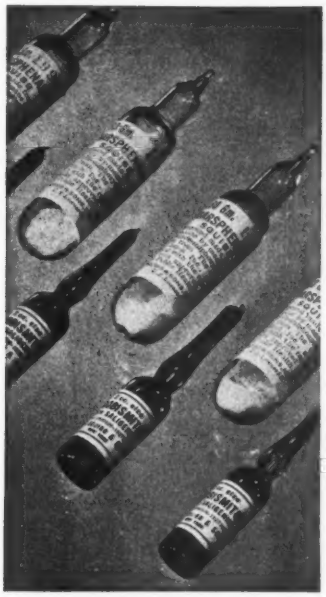

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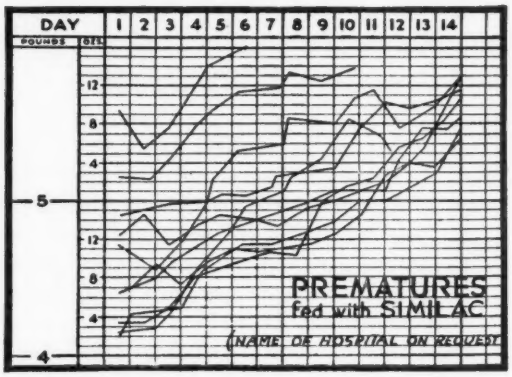

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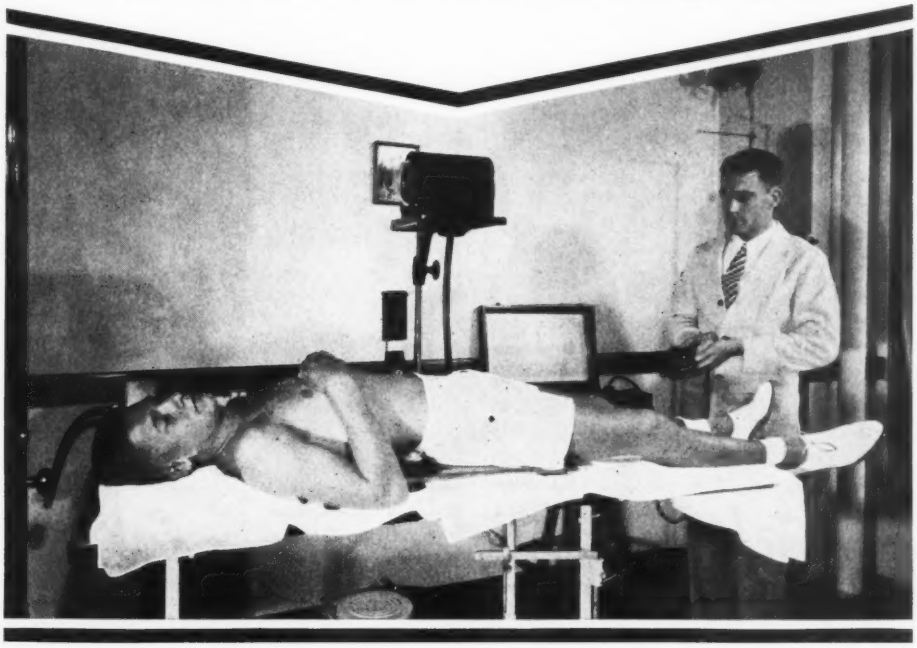

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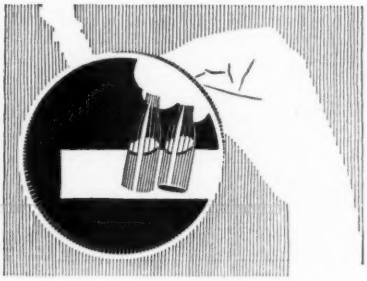

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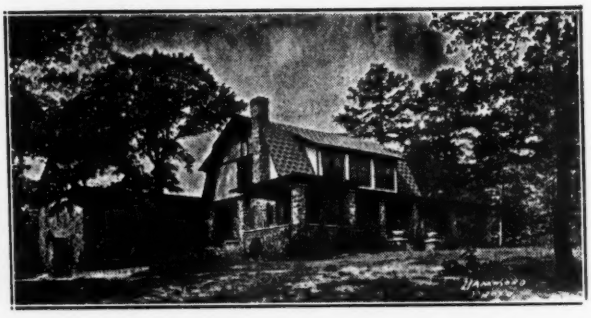

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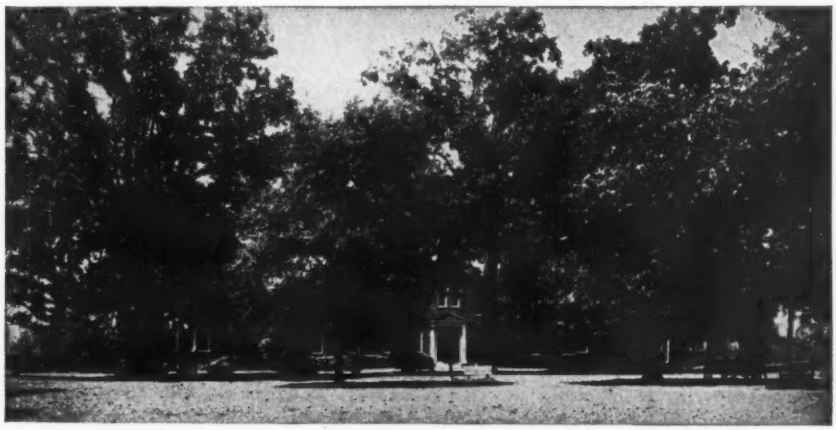

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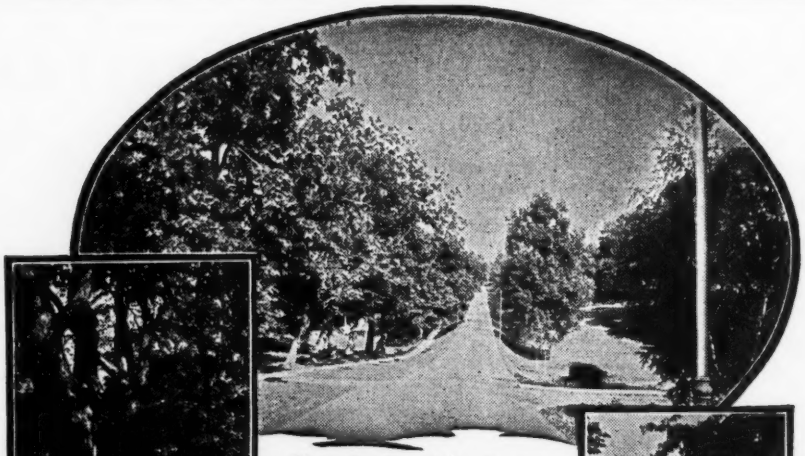

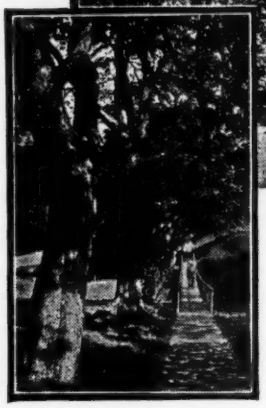

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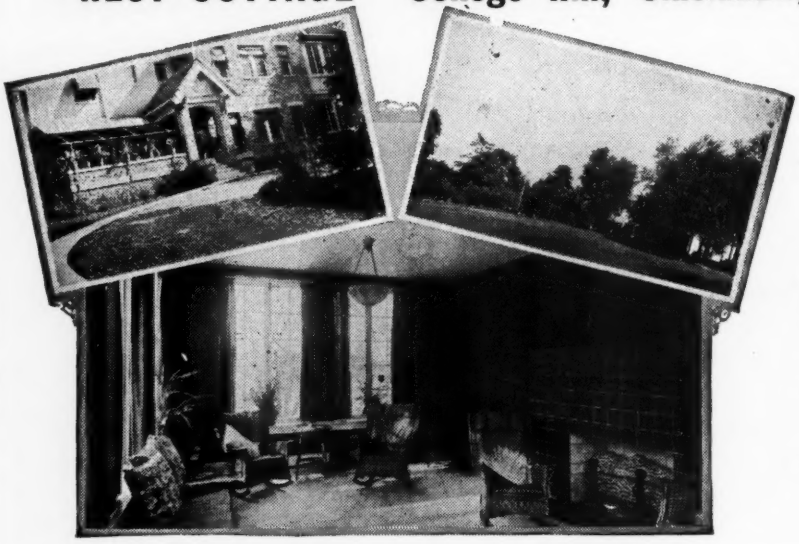

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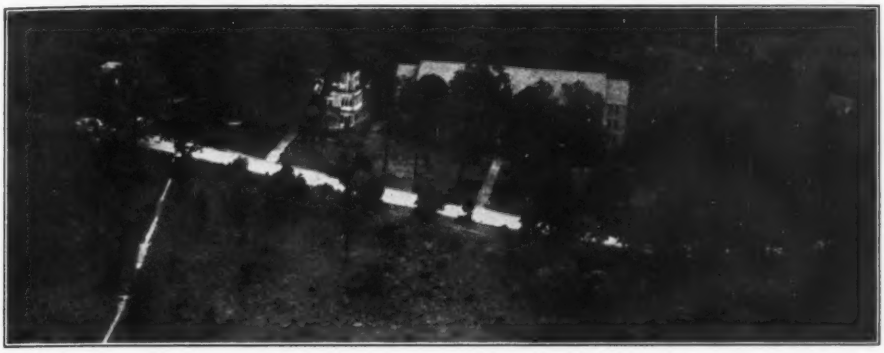

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Volume 29 APRIL 1936 Number 4

CARCINOMA OF THE RECTUM AND COLON*

By DANIEL FISKE JONES, M.D.
Boston, Massachusetts

Probably no surgical disease of importance has made such slow progress as carcinoma of the rectum, first because surgeons were not familiar with the operative treatment of the disease and could not show sufficiently good results to interest either the patient or the physician, and secondly because radical removal usually meant a colostomy, and most physicians felt that they would rather be dead than be alive with a colostomy. The reason for this was that most men knew of the results of a colostomy alone, without removal of the growth, which, while it does relieve much of the patient's discomfort, does not give complete relief and is therefore not completely satisfactory. Colostomy with removal of the growth, however, not only relieves the patient's discomfort entirely, but gives the patient a great psychological boost, provided he is taught how to control the bowel by diet and enemata or by diet and oil and enemata. It has been remarked by my assistants and myself many times that the majority of these patients have a better time than the average individual.

The physician is responsible many times even today for getting the patient to the surgeon late or not at all, not because of the difficulty of diagnosing the condition, but because of lack of interest in it. The diagnosis of carcinoma of the rectum can be made in 100 per cent of the cases presenting themselves, and in a somewhat smaller percentage of the cases of carcinoma of the colon. It is my feeling that every symptom referable to the rectum or lower abdomen should be considered as due to carcinoma of the colon or rectum until it is proven to be due to something else. If it could be impressed upon the laity, the medical student, and the surgeon that any change in bowel habit or sensation and bleeding, or bleeding alone suggest carcinoma of the colon or rectum and not hemorrhoids, I believe that a great advance would be made.

Blood in the stool is of great importance, and if an effort were made to determine its source much might be accomplished. While the most frequent cause of blood in the stool is hemorrhoids, there are many more important causes such as carcinoma of the rectum or colon, polypi, tuberculosis, lymphogranuloma, dysentery, chronic ulcerative colitis, and diverticulitis. The diagnosis of adenomatous polyp of the rectum or colon is almost as important as the diagnosis of carcinoma, for it is generally understood that a large percentage of carcinomata start in polypi. As bleeding occurs in about 6 per cent of the cases of diverticulitis, one should be very slow to make a diagnosis of diverticulitis when bleeding is present even though the x-ray shows diverticulitis.

Much emphasis is given in the text-books to certain symptoms which are actually of very little value. Among these is constipation. As a matter of fact, this symptom is of little or no value, except in carcinoma of the colon, as comparatively few patients with carcinoma of the rectum ever notice constipation. They slip quietly into a period of frequent movements without noticing constipation at any time, especially if they have taken mineral oil.

Diarrhea is another important text-book symptom, but as most patients do not consider that they have diarrhea it is not of much value. Frequent movements is an important symptom, however, and one must ask these patients if they have frequent movements and also as to how many times they go to stool to get rid of mucus, blood, and gas. Alternating constipation and diarrhea is another symptom which is rarely recognized by the patient.

Pain is a far more important symptom than

*Read in General Clinical Session, Southern Medical Association, Twenty-Ninth Annual Meeting, St. Louis, Missouri, November 19-22, 1935.

constipation. In carcinoma of the rectum the most frequent complaint is of an ache or a tired feeling over the sacral region or of discomfort in sitting. When the growth is far advanced there may be pain down one or both legs caused by pressure on the pelvic nerves or metastases in the pelvic bones. Abdominal pain due to partial or complete obstruction is present particularly when the growth is in the colon, but with carcinoma of the rectum the patient will rarely admit abdominal pain, though he may admit discomfort from gas in the lower abdomen. Pain in these cases is always in the lower abdomen, except when the growth is infected and the peritoneum involved so that the pain is localized in the region of the growth, and when the growth is in the cecum or ascending colon, causing pressure in the small intestine and pain about the umbilicus or above.

Other text-book symptoms of little or no value in diagnosis are ribbon stools, loss of weight, and the age of the patient.

A correct diagnosis of carcinoma of the rectum can be made in a very high percentage of cases by a proper digital examination, which means that the finger must reach the recto-sigmoid junction. It is well to remember that annular growths in the rectum often project into the lumen as a cervix projects into the vagina, and that in a careless examination the finger may follow around the rectal wall and miss the growth entirely.

If nothing can be felt by digital examination, the sigmoidoscope must be used. This instrument must be used with intelligence, however, or it is of little value. It is true that occasionally the growth cannot be seen because it holds the rectum in such an angle that it cannot be uncovered, or because the growth is hidden behind a valve or fold, not infrequently at about 15 cm. from the external anal orifice. Careful examination when withdrawing the sigmoidoscope will often uncover a growth at this point, and when it is impossible to get up the full length of the instrument, there is no reason why it should not be used to feel with, for it is essential to know why a satisfactory examination is impossible.

As the average roentgenologist can make a correct diagnosis of carcinoma of the rectum in only about 40 per cent of the cases, it is evident that it is hardly reasonable to depend upon such a method when proper digital and proctoscopic examinations will give a correct diagnosis in 100 per cent of the cases. The x-ray should never be used until cancer of the rectum has been definitely ruled out by these two methods of examination. For carcinoma of the colon, however, we are dependent to a considerable extent upon x-ray examination which, when done by the average roentgenologist, results in a correct diagnosis in about 65 per cent of the cases.

It is important, I believe, for the surgeon when he begins to operate upon these cases to decide whether he is going to operate upon only those cases he thinks he can cure, or upon all the cases he thinks he may cure and upon all those he thinks he can make more comfortable physically and mentally for one or more years. It is much more pleasant, of course, to report 72 per cent of five year cures, as Miles does, than to report 50 or 55 per cent as I do, but if we use the figures properly, the group that gives 50 to 55 per cent of five-year cures will be more satisfactory. For example, Miles operates upon 32 per cent of the cases seen and out of each hundred seen has 21 per cent alive at the end of five years, while I operate upon 62 per cent of the cases seen and have 26 per cent alive five years later, regardless of the fact that the posterior excision and combined abdomino-perineal excision in two stages are included. Many surgeons feel that it is useless to operate when metastases to the lymph nodes are present, but I have many patients alive five or more years, even when metastases to the nodes have been found at operation. It is also the general belief that small growths give good results, but a considerable percentage of small posterior wall growths when they come to operation have metastatic nodules in the liver, invasion of the mesenteric lymph nodes or distant metastases. The size of the growth, therefore, does not determine its operability. In very few cases can a decision as to operability be reached before an exploratory operation is done.

The decision as to whether or not a radical operation shall be done, it is evident, depends upon the ideals of the surgeon, his experience with these operations, his judgment as to what he can accomplish, and the ability of the patient to withstand an operation. It has been my habit to remove any growth which could be removed without leaving any visible growth behind. At one time I found that I had done a radical operation even with metastases in the liver in about 4 per cent of those operated upon. It is useless to consider a local operation simply because an occasional good result has been obtained, and it is my feeling that the surgeon

should do the most extensive operation possible with a reasonable mortality.

If we are going to do the best possible for our patients, we must have at least five operations to suit the various conditions, the skill of the surgeon, and the condition of the patient. These five operations are:

(1) Combined abdomino-perineal amputation of the rectum in one stage.

(2) Combined abdomino-perineal amputation of the rectum in two stages.

(3) Colostomy without dissection of the pelvis, and amputation of the rectum by the posterior route.

(4) Combined abdomino-perineal resection of the rectum with preservation of the sphincter.

(5) Excision of the growth above, with a colostomy.

It is impossible to discuss all these operations in detail; I shall therefore confine myself to the combined abdomino-perineal operation in one and two stages.

While Miles, of London, deserves credit for standardizing and popularizing the one stage operation by his publication of 1912, Czerny suggested and tried out this operation in 1883 and it was tried by several surgeons between 1883 and 1912. Because of the high mortality, however, it was not popular for many years after Miles' paper. Miles worked out the lymph drainage of the rectum and advised an extensive operation comparable to operations done for carcinoma in other regions. His operation therefore removes as large an area of lymphatic drainage as possible, and the results seem to warrant the added risk of this procedure.

Miles' operation as modified by myself consists of a dissection of the pelvis after peritoneal flaps on both sides of the rectum and lower sigmoid have been freed. A peritoneal flap is turned up anteriorly and the dissection carried well down on the vagina or to beneath the seminal vesicles. Beginning with a freeing of all tissue from the iliac arteries, a line of cleavage is entered beneath the pelvic fascia which is carried down posteriorly and laterally to the levatores ani, leaving the lateral attachments of the rectum. The ureters have been exposed to avoid injury. The rectum is now pulled up, the lateral attachments are cut and the anterior and posterior dissections joined. The superior hemorrhoidal is now tied below the left colic and the dissection carried up to the sigmoid, which is double tied and sectioned. Rubber dam is tied over the ends and the distal end put deep into the posterior portion of the pelvis. The pelvis is then covered with peritoneal flaps, which can be done easily if the peritoneum is well freed at both sides of the bladder where it is held down firmly. The proximal end of the bowel is brought out the left paramedian incision for a colostomy. The sigmoid from its attachment to the lateral abdominal wall to the colostomy is sutured to the lateral and anterior abdominal wall to prevent the small intestine getting between this loop of bowel and the abdominal wall. No sutures are put in the colostomy.

The patient is now put into the reversed Trendelenburg position. An incision is made about the anus and the anus closed with a silk suture. The dissection is then carried upward; all the ischiorectal fat and the levatores ani close to their attachments are freed. The dissection is carried as far away from the bowel as possible into the dissection above. I have found it an aid to cut through the fascia covering the rectum laterally and carry the dissection to the prostate. This gives a landmark which is an aid in freeing the rectum from the perineum to the prostate, a dangerous region.

The modifications of Miles' operation are first that Miles does not remove the pelvic fascia and therefore does not remove the presacral nerves, and second that he does not dissect up peritoneal flaps to make the pelvic floor and in consequence does not remove all the pelvic fat. He has difficulty for this reason in covering the pelvis. In the posterior portion of the operation Miles carries his dissection at once into the upper dissection posteriorly and pulls down the end of the bowel, freeing it by cutting close to the bowel laterally as it is pulled out. This method of removing the rectum is undoubtedly responsible for the complete absence of bladder paralysis and bladder complications which Miles reports, as the dissection is carried close to the bowel and avoids the filaments from the second, third, and fourth sacral sympathetics.

The combined abdomino-perineal amputation of the rectum in one stage is, I believe, the best operation that has been devised up to the present time, but as it cannot always be done we must have an operation, especially for the removal of high growths, which can be done on poor risk patients. The combined abdomino-perineal operation in two stages is very useful on patients who are in too poor condition to

stand the one-stage operation, and is carried out exactly like the one-stage operation until the whole pelvis has been dissected and the peritoneal flaps are about to be sutured over the pelvis. It is then decided whether the operation is to be in one or two stages. If it is to be in two stages, the superior hemorrhoidal artery is tied below the left colic and the mesentery incised from this ligature up to the arches from the left colic artery. Instead of the sigmoid being sectioned at this point, more sigmoid is brought down until the incision in the mesentery can be placed in the pelvis beneath the peritoneal flaps which are to be sutured about the bowel. The sigmoid is brought into the wound for a double barrel colostomy, great care being taken not to injure the vascular arches of the bowel. With a sufficient blood supply to the bowel in the pelvis it is possible to postpone the second stage from one to four weeks if necessary. The second stage of the operation is exactly similar to the posterior portion of the single stage except for the fact that the sigmoid must be double clamped just beneath the peritoneum. The proximal end may be inverted or simply tied.

The very definite objection to this operation is that the proximal end will undoubtedly open into the pelvic cavity in a large proportion of cases and delay the healing of the pelvic cavity indefinitely. It will heal in every case, however, unless there is a foreign body or malignant disease present.

Another two-stage operation which makes it possible to do many old, fat, or feeble patients consists of a colostomy without any dissection above, and after a sufficient time to permit the patient to pick up, from one to six weeks, the removal by the posterior route of the growth, ischio-rectal fat, sphincter, and rectum to well above the growth. Many feeble patients will stand this operation and it should be the operation of choice for many surgeons when the growth is in the ampulla or below.

Another operation, which is of great value in high growths in people who cannot stand a combined abdomino-perineal operation, is carried out by doing through the abdomen a dissection of the pelvis to below the growth. The bowel is double clamped, sectioned and the growth and bowel with its mesentery turned out to make a permanent end colostomy. The distal end of the bowel is closed and the peritoneal flaps sutured about it, leaving the suture line intraperitoneal.

The fifth operation which seems to be necessary is a combined abdomino-perineal resection of the rectum with end-to-end suture or with the sigmoid brought down through the anal canal and the sphincter preserved. I approve of this only in very rare cases, for unless the bowel is sutured some distance above, the sphincter will not be completely controlled. Any leakage from a sinus or lack of control of the sphincter leaves the patient in a much more uncomfortable condition than an abdominal colostomy.

That the two-stage operation is of value is evident from the fact that Coffey, Dudley Smith, Bartlett, Rankin and Lahey have all developed two-stage operations. Bartlett, so far as I can learn, should be given the credit for reversing the usual method of procedure and beginning it in the perineum. His paper was published in the *Archives of Surgery* in May, 1931, while Rankin's was published in October, 1931. The one objection common to all these operations is that they are carried out in fields more or less contaminated. Rankin and Lahey do a preliminary colostomy in a region in which the incision for dissection of the pelvis must be made, while Bartlett dissects the whole pelvis from the incision in the perineum, a very difficult area to sterilize.

The type of operation to be done is no more important than the preparation of these cases. Those suffering from partial or complete obstruction should be relieved in some way. T. E. Jones' use of small and frequent doses of epsom salts until the bowel is entirely cleared out is, I believe, dangerous in the hands of the inexperienced. The obstruction is sometimes increased, and at times the patient is so reduced by the low diet, the lack of appetite, and the catharsis that it is impossible to bring him back into a reasonable condition. In addition to that, I much prefer dry feces in the intestine to liquid feces, and unless great care is taken the intestine will contain liquid feces after catharsis.

Bartlett suggests a colostomy high in the ascending or transverse colon, using a stiff tube 1 cm. in diameter, while Rankin and Lahey do a permanent colostomy in the lower left quadrant or through a paramedian incision. I personally prefer a cecostomy with a half-inch tube, about which the bowel has been inverted. This keeps the operative field clean and will close of itself when the tube is removed. I much pre-

fer a cecostomy to catharsis unless there is only very moderate obstruction.

The patient must be prepared in other ways than simply by relief of obstruction. Glucose and digitalis are often necessary.

The anesthetic in these operations is of great importance. I appreciate that the majority of surgeons prefer spinal anesthesia, but I much prefer ether in most cases provided a skillful anesthetist, who will not use more ether than is necessary, is in charge. It is true that with spinal anesthesia relaxation is complete provided one can get through the abdominal section before the anesthesia gives out. This I consider a distinct disadvantage because one is forced to hurry or give a general anesthetic, either of which I consider poor surgery. Spinal anesthesia is to be preferred in proper cases in the second stage of the combined abdomino-perineal operation in two stages and in amputations by the posterior route. High blood pressure we consider a contraindication to spinal anesthesia.

There are many postoperative complications. Hemorrhage should rarely be of any importance, but the blood pressure is often low, largely, I believe, because of the position of the patient on the table. Many men therefore give a transfusion routinely at the end of the operation. This I do only rarely. Sepsis, which used to play an important part in the mortality, rarely does so now.

Obstruction has become one of the most important factors in the mortality in these operations so far as I am concerned, in spite of the fact that everything has been done to avoid it, even to using amniotic fluid! The sigmoid is sutured to the lateral and anterior abdominal wall to prevent the small intestine getting between the colostomy loop and the abdominal wall, and all denuded areas are covered. While I have always been opposed to admitting that there is a simple paralysis of the intestine after operation, I have been obliged to admit it in at least four cases.

Probably the most annoying complication of all is temporary paralysis of the bladder due, no doubt, to injury to the sympathetic nerves from the second, third, and fourth sacral nerves. In addition to that, many of these patients are at an age when the prostate is enlarged and some of them must have a prostatectomy before they can void. It should be noted also that the great majority of men are impotent after this operation.

Phlebitis or a pylephlebitis is rare in spite of the large dissection in the pelvis and the proximity of the portal system, and death from lung emboli is infrequent. Infection of the abdominal wound is rare in spite of the fact that the colostomy is brought out through the paramedian abdominal incision and in spite of the fact that the colostomy is opened in from twenty-four to forty-eight hours.

In presenting the results of my radical operations I wish to point out that unless some standard method of presenting statistics in malignant disease is adhered to, they can be of little value. It is useless to state that one's mortality is 7 or 10 per cent unless it is stated at the same time that 25 per cent of the patients seen are operated upon.

Table 1

TOTALS OF PATIENTS SEEN, OPERATED UPON, AND TOTAL MORTALITY

		Per Cent
Total number of patients seen	672	
Total number of radical operations	427	
Percentage of operability	63.5	
Type of operation		
Combined abdomino-perineal, 1-stage	167	39
Combined abdomino-perineal, 2-stage	110	25.7
Combined abdomino-perineal, sphincter preserved	21	4.9
Colostomy and posterior excision	114	26.7
Abdominal excision and colostomy	15	3.5
Mortality of all groups	81	18.96

Table 2

TOTAL NUMBER OF ONE- AND TWO-STAGE COMBINED ABDOMINO-PERINEAL OPERATIONS

	Total No. Cases	Mortality Per Cent	Operated 3 Years+	Lived 3 Years+ (Operative Mortality Excluded). Per Cent	Operated 5 Years+	Lived 5 Years+ (Operative Mortality Excluded). Per Cent
HOSPITAL AND PRIVATE						
Combined abdomino-perineal, 1 stage	167	13	143	72.2	111	52.6
Combined abdomino-perineal, 2 stages	110	27	107	61	106	51.3
PRIVATE						
Combined abdomino-perineal, 1 stage	135	11	111	76.8	80	56.5
Combined abdomino-perineal, 2 stages	51	17.6	48	67.5	47	61.5

One cannot very well present such a paper as this without considering the use of radiation. It is my belief that any growth which can be operated upon by the surgeon in charge without

Table 3

COLOSTOMY AND POSTERIOR EXCISION

	Total No. Cases	Mortality Per Cent	Operated 3 Years+	Lived 3 Years+ (Operative Excluded). Mortality Per Cent	Operated 5 Years+	Lived 5 Years+ (Operative Excluded). Mortality Per Cent
Private	75	13	57	50	51	33
Hospital and private	114	19	96	50.6	90	37.7

a too high mortality should be operated upon rather than radiated.

Some statement should also be made in regard to the preparation of patients and the operations to be used in carcinoma of the colon. Rankin and Bargen have suggested a routine of catharsis and no residue diet in the preparation of these patients. If there is not too much obstruction this is of value, but the objection to it is that the surgeon will often neglect to decide properly as to the amount of obstruction. I know that at least two patients have lost their lives in a Boston hospital because of the use of cathartics and a no residue diet, because of poor judgment of course. Unless one feels quite positive that there is only a very moderate obstruction I believe that a cecostomy, ileostomy, or colostomy should be done first. A cecostomy is to be preferred in all such cases, except when the growth is in the cecum or ascending colon, and in these cases an ileostomy is the operation of choice. If cathartics are used in any of these cases, a sufficient time must elapse for the contents of the colon to be dried out, for liquid feces in the colon at the time of any resection is a very dangerous condition.

The decision as to the operation should depend to a large extent upon the amount of bowel to be obtained. The safest operation is without question the modified Mikulicz operation, in which the mesentery of the portion of bowel to be removed is freed and brought into the wound with the growth. If there is not sufficient bowel to give a wide margin on each side of the growth, however, the Mikulicz operation should be abandoned and, if possible, a lateral anastomosis done. This is a safer operation than an end-to-end suture, as there is no possibility that the blood supply will be interfered with during the suture, but if there is not enough bowel for this an end-to-end suture must be done. In this operation particular care must be taken to avoid tying or suturing the upright arteries from the arches of the colon. Furthermore, no attempt should be made to use any of these methods until it has been proven definitely that there is a sufficient blood supply.

During the last ten years or more there have been very few articles on the operative treatment of carcinoma of the colon which have not stressed the aseptic anastomosis to the exclusion of more important principles. It is true that an aseptic anastomosis is of value, but with a dry colon and proper technic little need be feared from infection at the time of operation. On the other hand, the blood supply and the prevention of intra-intestinal pressure are fundamental and absolutely necessary to a successful result.

ABDOMINAL LYMPHOBLASTOMA AND ITS TREATMENT BY IRRADIATION*

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Many physicians have the impression that the manifestations of Hodgkin's disease and lymphosarcoma, especially the enlargement of lymph nodes, always begin in the neck and thence extend to the mediastinum, axilla, abdomen and groin. This is often true, but in some cases the disease first affects the abdominal, mediastinal or inguinal nodes and later spreads to other groups of nodes. Enlargement of retroperitoneal nodes, especially those around the celiac axis, as the earliest manifestation of the disease is much more common than is generally realized. But even when the disease begins in the neck, axilla or mediastinum, it tends to invade the retroperitoneal nodes sooner or later. The presence of Hodgkin's disease or lymphosarcoma in the retroperitoneal nodes usually is accompanied by more or less tell-tale symptoms.

SYMPTOMS

Pain is not a common complaint; yet some degree of discomfort is rather common. Often

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*From the Section on Therapeutic Radiology and the Division of Medicine, The Mayo Clinic.

the abdominal discomfort is vague, especially during the early stage, and consists of a sensation of undue fullness long before an ordinary meal has been consumed. Increasing inability to eat an ordinary meal is frequently mentioned. This symptom may be associated with nausea and irregularly with vomiting. In some cases the foregoing complaints may be associated with increasing constipation, with an increasing tendency to distention with gas, or both.

The patient may complain of pain in the back, on one or both sides, and the pain may extend to one or both hips, and sometimes down one or both lower extremities. The pain appears to be due to pressure by hyperplastically enlarged, retroperitoneal nodes on the lower thoracic and lumbar branches of the lumbosacral plexus and is almost uniformly relieved after thorough roentgen irradiation of the lower thoracic and lumbar regions.

Sometimes pain in a lower extremity may be accompanied by edema attributable to enlargement of the iliac and inguinal nodes; when this occurs, it is usually in association with involvement of the retroperitoneal nodes, even if such involvement cannot be positively demonstrated. The presence of any or all of these symptoms, even when enlarged abdominal nodes cannot be palpated, might suggest retro-abdominal lymphoblastoma. By themselves these symptoms are not conclusive; the most significant feature is their slow, gradual increase.

Two symptoms which are of great diagnostic importance when present, but which are lacking in many cases, are fever and pruritus. Usually the fever occurs in the afternoon, and, while it may vary to some extent in different cases or at different times in the same case, it continues more or less steadily or tends to increase slowly. In other cases, especially in Hodgkin's disease, the fever may appear in irregular waves interrupted by periods of remission (the so-called Pel-Ebstein fever). Pruritus may be local or general. For some time, at the beginning, the itching may be limited to certain parts of the body, such as the upper or lower extremities, or the face, but later it tends to become general. With the pruritus may be associated discrete or diffuse infiltration of the skin; when discrete, the cutaneous lesions are usually papular and are often accompanied by numerous scratch marks. Lymphoblastomatous infiltration of the skin may occur without any pruritus, but this is uncommon. Also, it is important to remember that the abdominal nodes may be markedly involved without the patient's being aware of fever or pruritus. The diagnostic value of these two symptoms lies in the fact that they indicate invasion of the abdominal (retroperitoneal) nodes by the lymphoblastomatous process. Why this should be so remains an unsolved problem, but that it usually is so is proved by the fact that both the fever and itching, and the cutaneous lesions also when these are present, usually diminish more or less rapidly after thorough irradiation of the abdomen, whereas such a favorable effect is not observed after irradiation of other regions.

Physical Findings.—Enlarged retroperitoneal nodes may or may not be readily palpated. This depends on the degree of enlargement of the nodes, on the muscular development and tone of the abdominal wall, on the ability of the patient to relax, and on the skill of the examiner. Distention of the intestine with gas, or ascites, may prevent a satisfactory examination. When individual nodes cannot be felt in the epigastric and umbilical regions, and on each side of the spinal column, a sensation of undue resistance and of tenderness on deep pressure is commonly obtained. This finding is usually bilateral, but the lymphadenopathy may be more pronounced on one side than on the other. Sometimes, in fact, enlarged nodes on the left side may form a mass that may deceive the examiner into assuming that he is palpating an enlarged spleen instead of a mass of hyperplastic lymph nodes; or, if the mass is situated high on the right side, it may erroneously be thought to represent the liver. Sometimes, also, the anterior, inferior border of the liver may be abnormally low, and it may be assumed that the liver has become infiltrated by the lymphoblastomatous process. Hepatic infiltration or metastasis does occur in some cases, usually late in the course of the disease; in the majority of cases, however, the liver probably is not affected, but its anterior portion is pushed forward and downward by enlarged retroperitoneal nodes crowding the posterior part of the organ upward and forward. Evidence to support this view is to be found in the fact that, as the retro-abdominal nodes retrogress after thorough irradiation, the liver rapidly resumes its normal position.

Complications.—A great variety of complications may develop during the course of the lymphoblastomatous process, but, since these are part of the disease in general and are not especially related to the abdominal phase, and since

these complications have been mentioned elsewhere,* they need not be considered here.

REPORT OF CASES

The following cases are cited only to serve as examples of lymphoblastoma primarily affecting the abdominal nodes. If space were available, a large number of similar cases could be recorded:

Case 1.—The patient, a woman aged 36 years, registered at the clinic March 21, 1927. The chief complaint was of abdominal distress. Until a year and a half previously her health had been excellent. While pregnant, early in 1926, she had had pernicious vomiting for two months, for which a therapeutic abortion had been induced. After this she had become conscious of a heavy sensation in the abdomen after meals, especially after eating heavy foods. This had been accompanied by belching, after which she had felt somewhat relieved for about two hours. Then epigastric discomfort returned, but was partly relieved by taking food or soda. This sequence of events had repeated itself without remission. For a few weeks the patient had attempted to relieve herself by taking only broths, or malted milk, because she had found that solid food induced nausea, without vomiting. Some twenty years before, she remembered an attack of severe abdominal pain, in the course of which a hypodermic injection had been given her. A physical examination did not elicit any significant findings, and roentgenologic examinations of the thorax, stomach and gallbladder also yielded negative results. The patient's symptoms were thought to be related to an ill-defined functional disturbance.

One night in May, 1933, the patient was awakened by abdominal discomfort, which reminded her of the sensation of fetal movement during pregnancy. For a short time the lower part of the abdomen "raised up," as she described it, but subsided again after a few minutes. She had no further disturbance until the end of June, when lying in bed and thinking what the previous attack might have meant, she passed her hand over the abdomen and thought she felt a lump. A physician, whom she had consulted, had corroborated her finding. For about a week previously she had had a moderate backache on the left side. Her digestion had been normal, and the bowel also had functioned normally. For a long time she had noticed shortness of breath on slight exertion, and edema of the feet and ankles during hot weather. In every other respect her health had been excellent.

On examination, the tonsils gave evidence of acute follicular inflammation, and an exudative membrane covered the left tonsil. In the umbilical and left lumbar portions of the abdomen could be felt a large, smooth, movable and slightly tender mass. As far as could be determined by palpation, the tumor was not attached to the uterus and did not originate in the pelvic organs. A roentgenologic examination of the stomach, colon, thorax and spine gave negative results. Between the eleventh and twelfth ribs, on the right side, a small shadow appeared to represent a gallstone. At that time the urine was normal and the concentration of hemoglobin was 16.2 grams; the erythrocytes and leukocytes were not counted.

On July 20, 1933, exploratory laparotomy revealed, in the mesentery of the small bowel, a soft, vascular growth, the appearance of which suggested sarcoma. Since its removal could not be accomplished without resecting 10 or more feet of small intestine, the surgeon abstained from such a procedure. Specimens of the tumor were removed and microscopic examination disclosed that it was a lymphosarcoma.

Between July 31 and August 10, 1933, the entire abdomen was irradiated through four anterior and four posterior fields, with roentgen rays generated at 135 peak kilovolts, filtered anteriorly through 4 mm. of aluminum and posteriorly through 6 mm. of aluminum at a focal skin distance of 40 cm., each of the four anterior fields receiving 5 ma. for eighteen minutes (or approximately 560 roentgens measured in air) and each of the four posterior fields 5 ma. for twenty-eight minutes (or approximately 560 roentgens measured in air). This course of irradiation was accompanied and followed by considerable gastro-intestinal reaction (anorexia and nausea), the anorexia continuing for about two weeks. In spite of this, the abdominal tumor diminished in size at a rate corresponding to the usual average rate of lymphoblastoma.

Between September 4 and 12, 1933, a second course of treatment was given. On this occasion the tumor was irradiated through the anterior aspect of the abdomen by means of a large pack of radium, totaling 16,040 mg. hours, and through the posterior aspect with roentgen rays under the same conditions as in the first instance.

The patient's condition continued to improve. During the next three months she regained more than 20 pounds (9 kg.) of the weight which she had lost previously. She still mentioned backache, which did not extend to the hips or lower extremities. She had not menstruated since the operation in July. Examination disclosed residual enlargement of the retroperitoneal nodes, but the large mass which formerly was the outstanding feature had disappeared. Between December 6 and 15, 1933, a third course of treatment, by roentgen rays to the abdomen, was given. When she was seen again, in March, 1934, her general condition was excellent, and she had been almost free from pain since the previous course of treatment in December, 1933. Her endurance was still deficient and moderate activity fatigued her. On this occasion the only physical finding was a sensation of deep resistance on each side of the spine and slight tenderness on deep palpation of the abdomen, along the spine. Another course of treatment, directed solely to the retroperitoneal nodes, was given between March 13 and 16, 1934.

When the patient returned, in October, 1935, she reported her condition as excellent, and her appearance confirmed her own impression. She had been wholly free from pain or digestive disturbances.

An interesting feature of the case must not be overlooked. At the time of her initial admission, in March, 1927, a routine blood examination had given the following results: hemoglobin, 73 per cent; erythrocytes, 4,840,000; leukocytes, 6,900. When she returned, in July, 1933, moderate leukopenia had developed. After each course of roentgen or radium irradiation, the number of leukocytes diminished to 3,000 and even 2,400. In spite of the fact that she has not been

*Desjardins, A. U.; Habein, H. C.; and Watkins, C. H.: Unusual Complications of Lymphoblastoma and Their Radiologic Treatment. Amer. Jour. Roentgenol. & Rad. Therap. (in press).

irradiated since March, 1934, the leukopenia has continued. Throughout 1935 the leukocytes have ranged between 3,400 and 3,900. The patient feels well and is free from pain, but has little endurance and becomes fatigued after slight exertion. She has discovered that when she takes liver regularly she feels better and the number of leukocytes increases, but falls again as soon as the use of liver is discontinued. At the time of her latest examination, in October, 1935, evidence of cervical, axillary, inguinal or mediastinal lymphadenopathy could not be found. Deep resistance and tenderness on palpating the upper half of the abdomen pointed to residual adenopathy in the retroperitoneal nodes, but the absence of symptoms for many months indicated that the lymphoblastomatous process was quiescent.

In all probability the early symptoms, of which the patient had first become aware in 1926, were the first indications of lymphoblastoma, but the clinical manifestations were so slight and indefinite that their possible significance was not realized at the time. If, when the abdominal mass was discovered, in May, 1933, our knowledge had been what it is today, exploratory laparotomy would not have been necessary. The rapid regression of the hyperplastic, retroperitoneal nodes induced by thorough roentgen irradiation of the abdomen should have been sufficient to distinguish lymphoblastoma from any other condition with which it might be confounded.

The pain in the back had been confined to the left side, probably because only on that side had the nodes become sufficiently large to cause undue pressure on some of the spinal nerves near their point of exit from the spinal canal. This clinical assumption was supported by the physical findings.

As for the behavior of the blood, this case presents a rather uncommon feature which until recently has not received much attention. In both Hodgkin's disease and lymphosarcoma, after well planned roentgen therapy, the number of leukocytes, if previously greater than normal, tends to return to the normal level; the erythrocytes and hemoglobin, if previously deficient, tend to increase and not infrequently return to their normal level. Naturally, many variations of this theme are encountered. A common sequel of radiotherapy is a temporary leukopenia which may continue for three or more weeks; thereafter, the leukocytes, especially the lymphocytes which are most affected, tend to regenerate. This sequence of events may be repeated each time the patient is treated; this depends on the extent and intensity of the treatment. Moreover, as time goes on, as the duration of the disease increases, and as the courses of treatment are repeated from time to time, the degree and duration of leukopenia induced by irradiation tend to increase, and the subsequent regenerative capacity of the affected cells tends to diminish. However, in these features also, wide variations are observed.

Sometimes it is difficult or impossible to be certain whether the diminished number of leukocytes is attributable to irradiation or is a result of the disease itself. Certainly, when a patient has never been exposed to roentgen rays or radium, an existing leukopenia cannot be attributed to these agents. When leukopenia is attributable to irradiation, there is a definite chronological relation between the two. The number of leukocytes, especially of lymphocytes, begins to diminish during a course of treatment and continues to diminish for from three to fourteen days afterward, depending on the total dose of rays given. On the same factor depend the duration of leukopenia and the rate of subsequent regeneration. Occasionally, especially when a patient has been treated from time to time over a period of months or years, some degree of leukopenia may persist indefinitely. Rarely, however, not only is the leukopenia prolonged and the tendency of the leukocytes to regenerate delayed or absent, but the number of leukocytes tends to decrease further, long after the influence of irradiation has ceased. In such cases the use of liver may have a distinctly favorable effect on the regenerative function. This case appears to be a clear example. In this instance the leukopenia developed too early to be a result of irradiation. The patient herself has discovered that, if liver is taken regularly, the number of leukocytes increases and her general condition improves perceptibly, and vice versa.

Case 2.—Fourteen months previous to the time when we saw the patient, a woman then aged 31 years, she had an attack of severe pain in the right side of the abdomen. The character of the pain recalled labor pain and it extended to the right thigh. She mentioned having frequently been distressed by a sensation of burning on urination, but she had never been conscious of fever and had not passed any stones. A physician had found blood, pus and sugar in the urine the morning after the attack, and the patient herself had noticed small clots of blood in the urine. On two or three subsequent occasions similar attacks had occurred, but the pain had been less severe. Cystoscopy had been performed three times, and the physician who had examined her had found a stone in the right ureter. On September 9, 1926, a urologist had succeeded in withdrawing a stone 8 mm. in diameter from the lower part of the right ureter. When she was examined again, on November 17, 1926, a catheter was introduced into both ureters and pushed up to the kidneys, without any evidence of obstruction being found.

When she was again seen, in February, 1927, she had been in bed continuously (with the exception of five or six days) since her dismissal in November, 1926. The pain in the region of the right kidney had continued and, whenever she attempted to evacuate the bladder, chills and fever developed, and pus appeared in the urine. Thorough urologic examination had disclosed pyelonephritis on the right side, and many gram-negative bacilli had been found in the urine obtained by means of a ureteral catheter. After this, she had had an occasional flare-up of pyuria but, on the whole, her health had been fairly good.

When the patient returned, in February, 1933, she complained that, about two months before, a cutaneous eruption which had been called urticaria had developed; this was accompanied by itching. At the same time she had a sensation of pressure in the lumbar region and around the rectum, as well as pain around the right hip, which extended to the right thigh and right leg. She had consulted a gynecologist, who had inserted a pessary, which she still wore, but which did not relieve her symptoms. Another physician whom she had consulted had injected varicose veins in the anterior portion of the right thigh, but this procedure also had been fruitless. In January, 1933, a third physician had discovered a mass in the epigastric region, and an exploratory laparotomy (elsewhere) had disclosed a mass infiltrating the mesentery. A specimen from this tumor had been examined by two able pathologists, both of whom had interpreted the pathologic feature as representing lymphosarcoma.

On examination, a few slightly enlarged nodes were found in both sides of the neck and in both axillae. However, the nodes in the neck and axillae were small, and their relation to the abdominal mass was rather doubtful; they may well have been related to a recent infection of the upper respiratory passages. In the abdomen, a large, irregular and slightly movable mass occupied the epigastric region and part of the umbilical and left hypochondriac regions. Several other smaller masses, also probably representing enlarged lymph nodes, could be felt in the right lumbar and both iliac regions. A roentgenologic examination of the thorax did not furnish any evidence of mediastinal lymphadenopathy. In view of her illness, the general condition of the patient was remarkably good; she had lost a few pounds and her strength had diminished slightly.

Between February 13 and 21, 1933, the anterior and posterior aspects of the abdomen and thorax were exposed to roentgen rays generated at 135 peak kilovolts, filtered through 4 mm. aluminum (two anterior abdominal fields), or through 6 mm. of aluminum (two anterior thoracic fields, one posterior thoracic and two posterior abdominal fields), at a uniform focal-skin distance of 40 cm., each field receiving 5 ma. for eighteen or twenty-eight minutes, according to the thickness of filter used (*Fig. 1*). When the patient reappeared for examination, on March 14, 1933, she had regained the weight which she had previously lost, the abdominal discomfort had diminished considerably, and the size of the abdominal masses had diminished 60 per cent. The previously enlarged iliac nodes, which had not been irradiated because of the danger of exposing the ovaries also, had remained stationary. Between March 14 and 17, the upper two-thirds of the abdomen were again irradiated through two anterior and two corresponding posterior fields, under the same technical conditions. When she returned, on April 17, 1933, she could still feel a sort of burning sensation in the back on the left side, from the shoulder to the hip, but the pain which she previously had was gone. She could eat as much as she cared to without distress. Enlarged nodes in the abdomen could still be felt on each side of the spine and in the iliac regions, and these were slightly tender, but the large masses previously present had disappeared. Between April 17 and 20, a third course of treatment, similar to the previous course, was given.

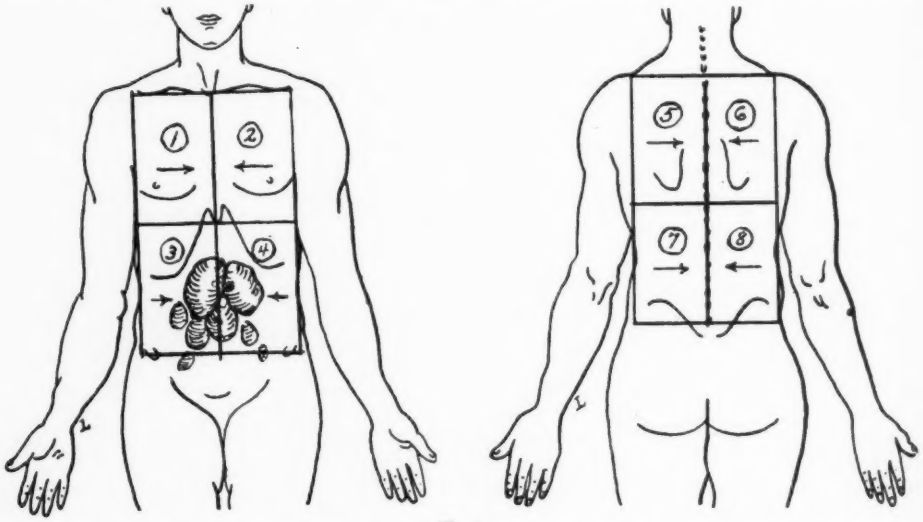

Fig. 1

Scheme of irradiation as used in the first course of treatment of Case 2. The arrows indicate that the different beams of rays were to converge toward the median line. Irradiation of the pelvis was avoided.

During the next two months the patient was entirely well and her weight increased 8 pounds (3.6 kg.). Toward the latter part of July, she again noticed a slight burning sensation around the sacral region and her endurance diminished slightly. Slightly enlarged, abdominal nodes could still be felt along the spine, and these were tender on pressure. When she ate a full meal, she still noticed a sensation of "crowding," but who does not? Her condition seemed so satisfactory on the whole that further treatment was not given. When she was seen again, on October 30, 1933, she had the appearance of radiant health and felt entirely well. Enlarged nodes could still be felt in both iliac regions but, since their size had not increased during the previous six months, treatment did not seem indicated and was not given.

In May, 1934, she reported that since her previous examination her health had remained generally good, but that, for a few months, she had again noticed a sensation of pressure in the abdomen and around the rectum, sometimes amounting to a desire to defecate and relieved by evacuation. This sensation appeared two or three days before each menstrual period and disappeared spontaneously as soon as the menstrual flow started. On examination, the retro-abdominal and iliac nodes were definitely larger than at the preceding examination, and this increase in size was thought to account for the sensation of pressure at the time of menstruation. On this occasion, after explaining the situation to the patient and to her husband, the entire abdomen was irradiated through four anterior and four posterior fields; the technical conditions of irradiation were the same as in the first instance, and the quantitative dose per field was 560 roentgens measured with the ionization chamber free in air (*Fig. 2*).

In December, 1934, the patient reported that menstruation had ceased for six months after the previous course of treatment, but that menstrual function had lately returned. For two weeks she had had pain low in the back and discomfort in the region of the right kidney. As for the abdominal or other lymphadenopathy, this was much less than in May, and treatment was withheld. In March, 1935, she reported that, about three weeks before, she had had abdominal pain for about one week. A physician whom she had consulted at the time thought it was attributable to a "spastic" colon. Such a disturbance might have been caused by fresh hyperplastic enlargement of the retroperitoneal nodes, but the pain could also have been caused by a transient flare-up of pyelonephritis. On examination, the retro-abdominal nodes seemed slightly larger than before, and, between March 20 and 28, 1935, the entire abdomen was again irradiated under the same conditions as in May, 1934.

Since then the patient's condition has been entirely satisfactory, or any disturbances that may have occurred have not been sufficient to cause her to inquire into their possible significance.

In this case also a laparotomy might have been avoided if the diagnostic value of irradiation had been realized. Inasmuch as the disease obviously has been active for some time and is controlled for prolonged periods by moderate irradiation at long intervals, the chance of extended survival is relatively good. However, it is never safe to allow such a patient to go indefinitely without examination. The symptoms of lymphoblastoma are insidious and their usual progress is slow. The wise course is to have the patient report for examination at fixed and

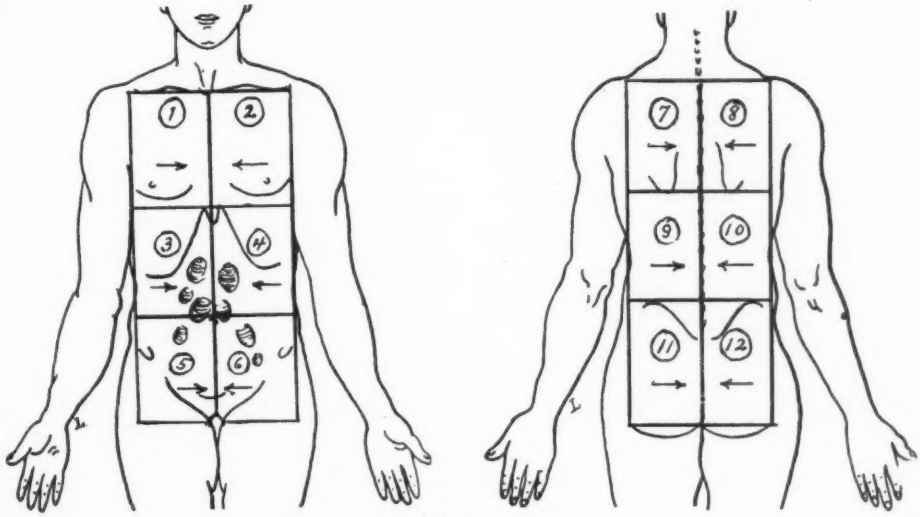

Fig. 2

Scheme of irradiation as used in the third course of treatment of Case 2. On this occasion, the entire trunk was irradiated from the anterior and posterior aspects, and the pelvis was included because the enlarged nodes in the iliac region on both sides had not previously shown any sign of regression and the symptoms indicated lymphoblastomatous infiltration of some of the pelvic structures.

regular intervals. Thus, fresh hyperplastic activity in the lymph nodes may be discovered when a limited course of treatment may be sufficient to arrest the process for weeks, months or years.

TECHNIC OF IRRADIATION

Concerning the technic of irradiation for lymphoblastoma, some divergence of opinion still exists. Impressed by the immediate recession of lymphadenopathy when the affected regions are exposed to rays generated at 200 peak kilovolts, some physicians are not aware that equal or better results may be obtained with rays generated at 135 peak kilovolts and filtered through 4 mm. or 6 mm. of aluminum, according to the situation of the nodes. Since the disease tends to extend from one group of nodes to another regardless of the technic of irradiation, and since permanent cure in nearly all cases is out of the question, the course of wisdom would seem to be to adopt a technic that can be repeated at intervals for an indefinite period. Treatment with rays generated at 200 kilovolts, unless the quantitative dose per field is considerably below the limit of tolerance of the skin, may not be repeated more than a few times without risk of jeopardizing the integrity of normal tissues or of inducing deleterious changes in the cellular elements of the blood. When, on the other hand, full or tolerance doses of rays generated at moderate voltage are employed, the same or even greater danger must be faced. But when only a moderate quantitative dose of similar rays is directed to each field, the treatment may often be repeated at intervals for months or years without much loss of radiosensitiveness on the part of the diseased cells. Under these conditions, also, deleterious changes in the blood are less likely to occur. The greater penetration of rays generated at 200 kilovolts is a disadvantage. The lymphoid tissues are so radiosensitive that such penetration is unnecessary. In the long run, the interests of most patients suffering from this disease seem to be more effectively served when the manifestations of the disease are treated with moderate doses of rays generated at moderate voltage.

Much more important than the voltage at which the rays are produced, however, is the precise method or plan of irradiation. By this is meant the number of beams of rays with relation to the clinical manifestations of the disease and to the physical findings, the care with which the beams of rays are directed to the affected regions, and the quantitative dose per field. Maximal doses are to be avoided because of the danger of inducing cutaneous or other changes which may shortly prevent subsequent treatment Patients who have been subjected repeatedly to maximal doses may subsequently become pitiful examples of excessive zeal.

In irradiating the abdomen it is a common practice to expose this part of the trunk through one anterior and one posterior field. But when, as in lymphoblastoma and certain other neoplastic processes, it is essential to include all the lymph nodes, from the diaphragm down to and including the groin, this can be accomplished much more effectively by dividing the anterior aspect of the abdomen (from xiphoid cartilage to groin) into four fields, with the navel as a center, and by dividing the posterior aspect into four additional and corresponding fields. The several beams of rays should be made to converge toward the median line, where most of the nodes are situated. Thus, not only are the abdomen and its contents more uniformly irradiated, but the effect of many converging beams of rays on the lymphoblastomatous process and its clinical manifestations is much greater than when only one anterior and one posterior field are exposed. If women still menstruate, however, irradiation of the pelvis should be avoided, unless marked lymphoblastomatous infiltration of the iliac nodes or of some of the pelvic structures should force the physician to disregard menstrual function.

Another question of considerable importance is whether to irradiate only the regions in which lymphadenopathy can be demonstrated or to treat more widely. After extended trial of different plans of treatment, we are convinced that not only the obviously affected regions but all the more important groups of lymph nodes should be systematically irradiated. Even if the mediastinal nodes do not seem to be involved, it is best to treat them also. Moreover, the treatment should be repeated at regular intervals of three or four weeks (unless pronounced leukopenia should prevent) until the lymphadenopathy has disappeared or until maximal regression of the enlarged nodes has been obtained. Even after apparently complete regression of the nodes, it is wise to give at least one more course of treatment. Only thus may prolonged arrest of the disease and improvement in the condition of many patients be expected.

GASTRO-INTESTINAL MALIGNANCIES: X-RAY FINDINGS*

By JOSEPH T. MCKINNEY, M.D., F.A.C.R.
Roanoke, Virginia

The census bureau of 1934 lists 140,771 deaths from cancer, as compared with 134,539 the year before. In 1930 throughout the United States cancer was second only to heart disease as a cause of death. In the State of Virginia deaths from cancer reached an all-time high in 1934, exceeding deaths from tuberculosis for the first time in the history of the Commonwealth, the bureau of vital statistics showing an increase of deaths from cancer of about 3 per cent over 1933. The digestive tract was the site of almost one-half of the fatal cancers. The stomach and liver are charged with 44 per cent of the cancer deaths among white males and 38 per cent among white females. Cancer of the peritoneum, intestines and rectum are slightly more frequent among females than males.

If we are to make any progress in lowering the increasing death rate from cancer of the gastro-intestinal tract, physicians must see these patients earlier and educate the laity in the great importance of seeking medical advice. All patients, particularly after 30 years of life, and with increasing importance those past 40 or 50, and in the sixth and seventh decades of life, who show any unusual digestive disturbance with or without loss of weight, loss of appetite, eructation of gas, pain which may or may not be relieved by food, bleeding either by the bowel or hemorrhage from the mouth, should be advised to have a complete gastro-intestinal x-ray, as this is the most reliable method of making an early diagnosis.

Cancer of the esophagus is to be diagnosed from benign lesions, more especially diverticula, strictures, spasm and simple ulcers. Usually this is not difficult, as the tumor gives a characteristic moth-eaten appearance.

We encountered an interesting case several years ago. Mrs. F., aged 64, had great difficulty in swallowing,

*Read in Section on Radiology, Southern Medical Association, Twenty-Ninth Annual Meeting, St. Louis, Missouri, November 19-22, 1935.

Fig. 1
Case 1. Marked filling defect in the esophagus indicating advanced cancer of the esophagus with diverticula.

Fig. 2
Case 2. Characteristic mottled and splotched appearance of barium-filled stomach in 5-year-old child due to trichobezoar, which was surgically removed. The hair ball forms almost a complete cast of the stomach.

showed loss of weight, emaciation and marked secondary anemia. X-ray examination showed evidence of a malignant pouch or diverticulum in the middle third of the esophagus with marked narrowing and irregularity of the lumen. This patient could not retain the barium, and it was impossible to get a satisfactory amount of barium into the esophagus. At no time could we get enough through the esophagus to visualize the stomach. An operation was performed with the idea of doing a gastrostomy, and to our surprise, as well as the surgeon's, there was found a far advanced cancer of the stomach, cardiac end. The patient died and postmortem examination showed extensive involvement of the esophagus, as well as the stomach.

Lesions found in the esophagus do not exclude lesions lower down in the digestive tract, and these must always be considered. Many cases of so-called cardiospasm are due to ulcers of the stomach and duodenum, or lesions elsewhere in the digestive tract.

As a rule cancer develops in the middle and late decades of life, usually after 40, though even the young occasionally are affected. Probably the greater number of gastric cancers develop in the age group 50 to 60 years. As to sex, there are on the average 60 males to 40 females. It is of the greatest importance to make an early diagnosis and bring these patients to an early operation. Unfortunately cancer of the stomach gives no typical symptoms in the early stages whereby an early diagnosis can be made from the history or physical examination. This is in contra-distinction to cancer of the colon and rectum, which often gives symptoms of mechanical obstruction. Peptic ulcer, on the other hand, usually gives a high acid content with subsequent pylorospasm associated with pain, this being uncommon in cancer of the stomach. Within the past few weeks Dean Lewis, of Johns Hopkins, in a lecture at Duke University, said that not over 20 per cent of cancers of the stomach seen in his clinic were operable.

The symptoms usually complained of are in the order named: indigestion, anorexia, pain, loss of weight, vomiting, hemorrhage either from the mouth or bowel, constipation, diarrhea, and lastly palpable mass. The most important sin-

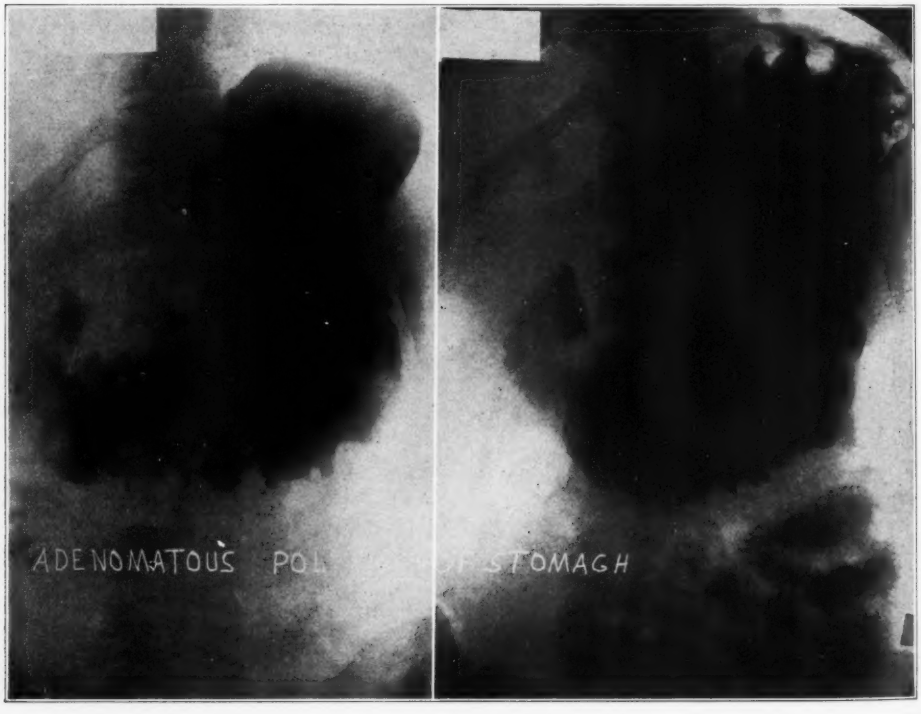

Fig. 3
Case 3. Characteristic finger print filling defects throughout the barium-filled stomach due to multiple adenomatous polypi.

Fig. 4
Case 4. Marked filling defect in the cecum and ascending colon due to carcinoma which was surgically removed with recovery of the patient.

gle thing with all these patients, which I again want to emphasize, is to insist that if there is a change in their symptoms or digestive disturbances, they consult their physician at once.

The two procedures of greatest value in arriving at an early diagnosis are an x-ray examination of the gastro-intestinal tract and gastric analysis. Upon a careful roentgen ray study, including fluoroscopy, will depend the accurate localization and determination of the growth or lesion. In the hands of a competent roentgenologist 92 per cent of cancers are diagnosed. Absence of free hydrochloric acid or a very low acid content is always an indication to rule out cancer by further study.

The usual duration of symptoms in gastric cancers varies in the different clinics, but averages from eight months to one year before the patient seeks medical advice and the diagnosis is made. Sprouell, Lahey and practically all other competent observers feel that any lesions found on the greater curvature of the stomach are malignant, and should be so classified.

The pyloric segment is the most frequent site of carcinoma. Eighty per cent of gastric cancers start here. Ulcers are least commonly found in this area. They seldom show niches as compared to other sections of the stomach, but do show spasm of the gastric musculature and mucous membrane swelling, with narrowing of the lumen of the pylorus, simulating carcinoma.

At the Massachusetts General Hospital, Aubrey O. Hampton, in 1932, reviewed a series of cases showing the degree of malignancy in chronic prepyloric gastric ulcerations. His conclusions were that approximately 12 cancers to one benign ulcer occurred in this section of the stomach. Of eight patients who had posterior gastro-enterostomies for what was thought to be benign chronic prepyloric ulcerations, all eight returned to the Massachusetts General Hospital and showed advanced cancer of the stomach.

Indirect roentgen ray signs of early cancer are a disturbance in peristalsis, which alters the shape and size of the stomach, with rapid emptying time. These early changes are due to infiltration and induration, with associated inflammatory reaction. The stomach becomes shortened when both curvatures are involved and the emptying time is hastened. These early cases do not show any definite roentgen filling defects which are characteristic of cancer.

Cancers of the cardiac end of the stomach are much rarer than in the body of the stomach. They may easily be missed if the patient is fluoroscoped only in the upright position. When

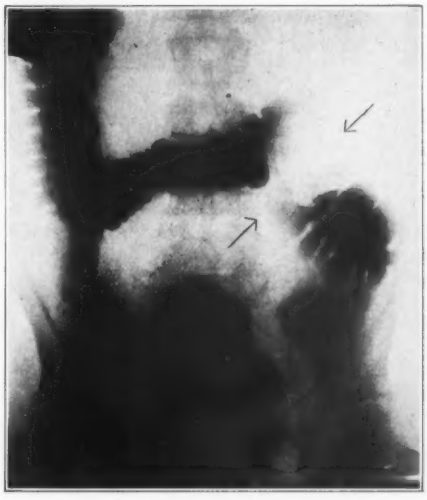

Fig. 5
Case 5. Marked filling defect of the transverse colon due to carcinoma. Surgically removed nine years ago. Patient in good health today.

Fig. 6

Case 6. Localized diverticulitis. Marked spasticity of the descending colon. Patient treated medically and symptoms cleared up in two weeks.

they are found, little can be done other than complete gastric removal. Lahey, Balfour and Walters, of the Mayo Clinic, and a few other surgeons have reported a small group of patients in whom total gastrectomy was successful and the patient lived for several years.

The differential diagnosis of ulcer from cancer of the stomach is not always easy, but the location of the lesion will help materially in making a decision. Cancer must be differentiated from ulcer, benign lesions, syphilis, adenomatous polyposis and foreign bodies.

Last year we had an interesting case of trichobezoar (hair ball) in a 5-year-old girl, which presented a large mass in the stomach, thought to be either a sarcoma or enlarged spleen or tumor of the kidney. The x-ray examination was typical, showing a peculiar splotchy streaking and mottling of barium coating over a hair ball which formed an entire cast of the stomach. The patient was operated upon and a large hair ball, almost the actual size and shape of the stomach, was removed.

About ten years ago a druggist in the early thirties was referred for gastro-intestinal x-ray with vague digestive disturbances, loss of weight and symptoms somewhat simulating an ulcer. X-ray examination showed a large area of translucency or lessened density not covered or surrounded by the barium, which was freely movable from one portion of the stomach to the other. A preoperative diagnosis of phytobezoar virginiana was made and the foreign body removed. This case was reported in detail by the author and Dr. William B. Porter.

Polyposis of the stomach, while rare, is occasionally seen. Mrs. H., aged 33, was referred for examination in 1933. She complained of fullness in the epigastrium, nausea, pain which was not relieved by food, marked emaciation, weakness and anemia. Gastro-intestinal x-ray showed numerous small punched out areas of lessened density throughout the stomach, having the appearance of finger prints. They were noted both in the cardiac end and pyloric segment of the stomach. A preoperative diagnosis of polyposis was made. This patient was operated upon and the polypi found to be so numerous that nothing could be done. For the past two years she has been given small doses of deep x-ray therapy. Definite clinical improvement has occurred and a recent x-ray showed far less polypi.

Several slides illustrating the different x-ray appearances of gastric carcinoma will be shown. The case of Mrs. A., aged 54, who showed only a slight filling defect in the film along the greater curvature of the stomach, was upon operation found to be a very extensive sarcoma of the stomach. Resection was done over a year ago, and the patient is in very good health today.

Fig. 7

Case 7. Perforated diverticulitis, air being noted in the soft tissues along the outer aspect of the descending colon. Patient treated medically, air absorbed and symptoms completely cleared up in three weeks.

Fig. 8

Case 8. Definite narrowing and irregularity of the sigmoid flexure. Roentgen findings interpreted as cancer of the colon. At operation the filling defect in the colon found to be due to a fibroid of the uterus and adhesions. Colon showing no involvement.

The x-ray diagnosis of syphilis of the stomach should be made with circumspection. Usually there is an absence of a palpable mass corresponding to the filling defect and there is very seldom any six-hour residue. The stomach, especially the pylorus, may be somewhat elongated and narrowed. The patient usually is apparently in better health than the x-ray appearance of the stomach would indicate. Anemia may be present, but cachexia is infrequently noted.

Every case of gastric carcinoma, if the clinical condition of the patient will permit, should be surgically explored. Often, however, the tumor is much larger and more extensive than it appears on the x-ray examination.

Penetrating ulcers of the stomach on the lesser curvature, if treated medically, even if a mass is present and can be palpated, if not situated near the pylorus, can usually safely be treated medically and will frequently completely heal. Slides of two such cases recently seen will be shown. As a rule, the enormous dilatation of the stomach, occasionally seen, is due to pyloric stenosis from ulcer or adhesions rather than cancer.

Cancer of the duodenum is exceedingly rare. A few cases have been reported, but as a rule malignancy in this area can be disregarded. Cancer of the small intestines occurs infrequently and is difficult of x-ray diagnosis.

Cancer of the colon is frequently encountered and can always be best diagnosed by the barium enema. The double contrast method as advocated by Webber, first injecting the opaque clysma, allowing most of it to return, and then injecting air is in some cases of great help, especially in polyposis.

The most frequent symptoms of cancer of the cecum, ascending and hepatic flexures of the colon are pain, palpable tumor, vague dyspeptic symptoms, with a marked severe secondary anemia. Cancer of the transverse colon does not cause as severe anemia as in the proximal segment, but gives more signs of obstruction, pain and varying degree of constipation. Cancer of the descending colon and sigmoid cause increasing constipation, occasionally diarrhea, more pronounced obstructive symptoms, pain and rectal bleeding.

The roentgen signs of cancer are the filling defect which must be persistent and constant, peristalsis in the involved area is generally absent, and there is a narrowing of the lumen of the bowel present. Malignancy of the colon must be differentiated from diverticulitis, especially the localized area of diverticulitis, which may be complicated by perforation, abscess formation, obstruction, fistula, peritonitis and adhesions. At times the differential roentgen diagnosis of diverticulitis from carcinoma is very difficult and can not be made. Several slides demonstrating cases of diverticulitis are shown. We are seeing a great many more cases of diverticulitis of the colon than formerly, not the generalized diverticulitis of the entire colon, but cases of localized diverticulitis in the descending and sigmoid flexures of the colon. These patients are usually in the middle decade of life, and give a history of left sided pain and discomfort, some loss of weight, occasional hemorrhage from the bowel, loss of strength and some anemia, and at times low grade fever. They should be put to bed with complete rest, bland diet, and mild gastric sedative with belladonna. Usually they clear up, but we wonder how many of these lesions will later develop into cancers. They should be checked from time to time with x-ray studies.

Fortunate is the patient if cancer of the colon causes a slight perforation, for then there will be localized pain, and he will seek his physician. Two slides are shown illustrating cases of early perforation.

Adhesions from inflammatory masses or tumors extrinsic from the colon may at times be very confusing. Mrs. H., aged 54, had loss of weight, hemorrhage from

the bowel, constipation and definite anemia. A barium enema showed a defect in the sigmoid flexure of the colon, which, while not characteristic, was thought to be a cancer. Operation proved the defect due to adhesions to the uterus, which contained a large fibroid.

Ulcerative colitis produces some degree of shortening and narrowing with thickening of the walls, and mucosal destruction in the affected area of the intestines, and is not often mistaken for carcinoma. Usually the lesion begins at the rectum and extends upward. In tuberculous ulcerative colitis the involvement generally starts in the cecum and ileum. Cancer is also quite frequently seen involving the cecum, and slides are shown illustrating cases of cancer of the cecum and different segments of the colon.

SUMMARY

All statistics show an increasing number of deaths from cancer of the gastro-intestinal tract. Early diagnosis by means of the x-ray and gastric analysis is emphasized. The one hope of lowering the death rate is the making of an early diagnosis and the bringing of cancerous patients to an early operation with surgical removal of the growth. Cancer gives no typical clinical symptoms, but all patients, particularly those past middle life with any unusual digestive symptoms, are urged to see their physician. Some of the commoner roentgen signs of cancer are shown in the slides demonstrated.

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DISCUSSION (*Abstract*)

Dr. C. H. Heacock, Memphis, Tenn.—Practically 100 per cent of gastro-intestinal lesions are demonstrable by x-ray and in over 90 per cent of these cases we can determine whether the lesion is malignant or inflammatory. This fact needs to be broadcast.

Dr. D. Y. Keith, Louisville, Ky.—Most members of this Section are quite competent to make correct diagnoses of the majority of patients who come to them for suspected malignancy of the gastro-intestinal tract. In looking over the literature briefly we find several statements that 90 per cent or more of the cases are diagnosed by x-ray examination on the first examination. It is to the 5 or 10 per cent that we as roentgenologists missed that I should like to direct my remarks.

The things that we should look for as early findings of malignancy of the stomach are: altered peristalsis which is present in 80 per cent or more of the cases; a slight change in contour and size of the stomach and evidence of induration seen on the film and not on the fluoroscope of the cancer-bearing area of the lesser curvature which is immediately prepyloric. In examination of the stomach where any of the above findings are present we should ask for a re-examination not later than one month after. If we do this persistently and consistently, we will raise our percentage of positive diagnoses, and we should remember that the cases we pick up among this extra few will be early cases.

In tumors of the cecum, anemia is the outstanding feature, and frequently is accompanied with a great deal of spasm at the site of the lesion as well as in distant areas of the colon. In the sigmoid colon the contrast enema is frequently of service and one should remember here that frequently films made in the Trendelenberg position will give information that you cannot obtain in using the orthodox position. This we would insist on doing in every case where a positive diagnosis cannot be made and a suspected lesion is present in the sigmoid.

It is the duty of the members of this Section to educate others to the fact that many cases of malignancy of the stomach and cecum that appear hopeless can be rendered operable by x-ray therapy. The same is true in tumors of the cecum, as we have seen an occasional case where the defect in the cecum entirely disappeared after proper radiation therapy. I should like to urge each of you to keep the points of re-examination, to obtain early cases, and to give that very small percentage of patients that have a radiosensitive tumor the benefit of radiation. Frequently a case will become operable that was first classed as inoperable.

In looking over the literature we came upon a reference to relief of distress by a proprietary drug. The patient on re-examination by x-ray apparently showed marked improvement. To our mind his relief of distress was accompanied by relief of spasm, and I doubt very much that there was any reduction in the size of the tumor. The apparent reduction in size was the result of the relief from marked spasm which frequently makes the defect much larger than it really is. Let me again repeat that a mass in the epigastrium in a male patient which shows altered peristalsis, change in contour and in size, is to be re-examined in a few weeks if a positive diagnosis cannot be made at the first examination.

MONOCYTIC LEUKEMIA CUTIS*

REPORT OF A CASE WITH BIOPSY STUDIES

By ADOLPH B. LOVEMAN, M.D.
Louisville, Kentucky

The medical profession has recognized for a number of years two types of leukemias as clinical entities, namely: lymphatic and myelogenous. Cutaneous manifestations of these diseases are not at all unusual, being encountered much more frequently, however, in the lymphatic type than in the myelogenous. Specific and non-specific eruptions have been described in both forms. When the histological architecture of the cutaneous lesions reveals a lymphoblastomatous structure, the manifestations are classified as specific infiltrations. These may be represented clinically by papules, nodules, plaques, tumors, infiltrations, or a generalized exfoliative dermatitis. Non-specific eruptions may also occur, such as urticaria, universal scaly erythrodermia, pigmentations, excoriations, secondary pruriginous papules, and other manifestations of a toxic nature.

In 1913, Reschad-Schilling-Torgau[1] described for the first time what they believed to be a third type of leukemia. Because of the prevalence of cells of the monocytic series, this was given the name of monocytic leukemia. Subcutaneous nodules were present in their patient, and histologic studies revealed the same type of cells in the tumor as were found in the peripheral blood.

The following case is reported because of the apparent rarity of cutaneous monocytic leukemia in the literature, and also because the evidence in this case, afforded by correlation of the clinical, hematological and histological studies, may lend some additional support in establishing this disease as a distinct entity.

CASE REPORT

Mrs. L. M., aged 31, was admitted to the Louisville City Hospital December 16, 1934, because of marked weakness, shortness of breath, and fever. These symptoms followed an attack of influenza three months previously, and from which she never completely recovered. The dyspnea increased and there soon developed marked swelling of the lower legs. There was occasional mild bleeding from the gums. Two weeks prior to admission she noticed some small nodules in the skin of the abdomen and thighs. These, however, caused her no discomfort. The past history was irrelevant.

The patient was a fairly well developed female adult. She was pale and appeared severely ill. Her temperature on admission was 102° F., pulse 120, and respirations were 30. The mucous membranes of the mouth were pale; but no ulceration, hemorrhage or nodules were noted. There was a generalized enlargement of the lymph nodes, the largest nodes being found in the neck. These were the size of a hickory nut, discrete, but not tender. The liver and spleen were not palpable. The skin presented an eruption confined for the most part to the abdomen, chest, and thighs (*Fig. 1*). This consisted of discrete, firm papules and nodules, varying in size from pea to hickory nut and suggesting somewhat a secondary syphilide. Some were apparently fixed to the overlying skin. The earlier and smaller lesions were the color of normal skin, whereas the older lesions assumed a purplish hue. At first glance many of these resembled melanomas. There was no tendency on the part of any of the nodules to ulcerate.

Roentgenograms of the chest, long bones, and spine were essentially negative. The blood Wassermann and urine examinations were negative.

BLOOD STUDIES

Date	Hemoglobin (Sahli)	Red Blood Count	White Blood Count	Remarks
12/17/34	30	1,800,000	11,500	
12/20/34	30	849,000	15,400	
12/21/34				600 c. c. citrated blood given by transfusion
12/22/34	35	1,300,000	18,050	Membrane present about molars
12/23/34				Gums becoming gangrenous
12/24/34	35	1,120,000	13,250	
12/26/34	30	1,130,000	7,050	
12/28/34				Gums sloughing
12/29/34				350 c. c. citrated blood given by transfusion
1/ 5/35	35	1,500,000	7,650	

The following differential count is representative and was made by Dr. Raphael Isaacs, of Ann Arbor, about ten days before the patient died:

Cells	Per Cent
Polymorphonuclear neutrophils (adult)	9
Polymorphonuclear neutrophils (young)	3
Metamyelocytes	2
Monocytes (adult)	14
Monocytes (young)	37
Monocyteblasts	15
Lymphocytes	19
Eosinophils	1

*Read in Section on Dermatology and Syphilology, Southern Medical Association, Twenty-Ninth Annual Meeting, St. Louis, Missouri, November 19-22, 1935.

*Studies and contributions from the Department of Dermatology and Syphilology of the University of Louisville School of Medicine.

Fig. 1

Note the two types of lesions: the small discrete papules resembling a secondary syphilide, and the larger nodules.

Nucleated red blood cells were rather frequently encountered. The predominating cell was the monocyte. These cells ranged in size from fifteen to thirty (15-30) microns in diameter. In many cells the cytoplasm was very irregular, giving rise to definite pseudopods (*Fig. 2*). The color of the cytoplasm was bluish grey and contained lilac granules. The nuclei were large, roughly oval, and vesicular. Many were indented, lobulated, and appeared folded upon themselves. The nuclear content consisted of finely reticulated spongy network. A few cells had nucleoli. Numerous blast forms were seen. These had a more basophilic cytoplasm and contained none of the small reddish granules. All transitions were found from the monocyte blast to the mature monocyte.

Dr. Isaacs made an unequivocal diagnosis of monocytic leukemia. He studied a histologic section from a cutaneous nodule and was able to identify the same type cells here as found in the blood smear. Dr. Paul Clough, of Johns Hopkins, also examined the smears and sections and expressed a similar opinion.

Histologic Examination.—A subcutaneous nodule and lymph node were removed for study December 18, 1934. Unfortunately, the lymph node was lost. The following was submitted by Dr. Harold Gordon, of the Pathology Department of the University of Louisville:

"Sections of the skin reveal a thinly cornified, atrophic epithelium with short, pointed rete pegs. The corium is extensively infiltrated by atypical spherical cells averaging about twenty-five micra in diameter (*Figs. 3* and *3-A*). They have a variable amount of cytoplasm which is irregular in outline, faintly eosinophilic and slightly granular. They are characterized by a large, eccentric nucleus, oval in outline and often indented or kidney-shaped (*Fig. 4*). The nuclei average about eighteen micra in their long axis. The chromatin content is distinctly granular, coarse granules and threads being separated by lighter staining portions. A few have nucleoli, but these are not a prominent feature. The nuclear membrane is sharply defined. Occasional mitoses are present. Nucleated reds are also present in moderate number. The cells give a negative peroxidase reaction.

"The infiltration is extensive and diffuse in the deeper portions of the corium. The cells infiltrate between the coarse collagenous fibers, in some areas appearing in linear fashion to present a cylindromatous appearance. They are, however, especially concentrated about the small nerves and sweat glands in the deeper portion of the corium, the subpapillary portion containing very few cells.

"The eccentric position, indented shape, and granular character of the nuclei and the large, irregular cell bodies identify these cells as monocytes and monoblasts. The diffuse infiltration and absence of signs of inflammation designate this as a neoplasm. The vessels are empty, but a recent clot contains many white blood cells similar to these infiltrating the corium and hardly any normal, mature leukocytes. The lesion, therefore, may be leukemic in origin.

"The interpretation is monocytic infiltration of the skin (monocytic leukemia)."

Clinical Course.—The patient continued to go down hill. She developed a gangrenous stomatitis which required surgical intervention. Some of the cutaneous nodules practically disappeared, but new ones continued to form. The prominence of the nodules varied from day to day, a very striking feature. The

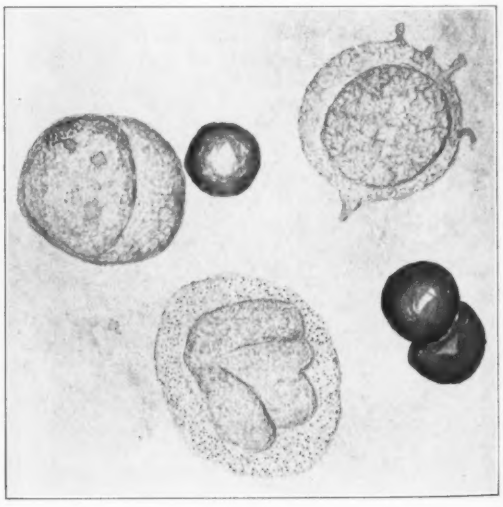

Fig. 2

Blood film of monocytic leukemia showing three stages in development of monocyte. Upper left, monocyte blast. Upper right, young monocyte. Center, adult monocyte. (*Courtesy of Dr. Raphael Isaacs.*)

Fig. 3-A
Low power magnification. Note diffuse and extensive character of the infiltration. Also observe that the cells appear in linear fashion, presenting a cylindromatous appearance.

patient bled from her mouth and rectum, but at no time were purpuric or petechial lesions noted. In spite of repeated transfusions and supportive suppurative therapy, the patient died twenty-nine days after admission to the hospital. Postmortem examination was refused.

DISCUSSION

The Monocyte.—There is at present a great deal of controversy concerning the existence of this third type of leukemia. The reason for this is the diversity of opinion over the origin of the monocyte. One group, sponsored by Maximow,[2] believes the monocyte, in common with other blood cells, arises from lymphocytes. This is based in part upon the resemblance of the two types of cells and also because of the apparent development of monocytes from lymphocytes in tissue cultures.

Naegeli[3] and his followers believe the monocyte to be myeloid in origin and offer as evidence the fact that it presents a special type of granulation which is not found in the lymphocytes; that it is usually oxydase-positive and that fluctuations from the normal more or less parallel those of the granulocytes. In addition, cases of myelogenous leukemia have been known to terminate in monocytic leukemia.

The third school of thought (Schilling,[4] Clough,[5] Sabin[6] and others, maintains that these cells originate from a primitive stem cell of the reticulo-endothelial system. This view is based on careful histologic and embryologic studies. They claim that fluctuations occur in the number of monocytes, but independent of fluctuations in the number of other leukocytes. Also that monocytes in the blood are usually increased in conditions in which there is hyperplasia of the reticulo-endothelial system and an increase in tissue histiocytes. They also maintain that transitional forms are encountered morphologically between monocytes and histiocytes.

Still a fourth view has recently been expressed by Farrar and Cameron,[7] who believe in a separate origin of the monocyte, distinct from the granulocyte series and the reticulo-endothelial system. They base such a view in part on

> "The progressive change in a patient's blood cells from the mature monocyte through a stage of younger cells to a very primitive blast, and the definite differences in morphology and staining characteristics between this primitive blast and the myeloblast."

According to Mitchell,[8] the view generally accepted today is well expressed by Cunningham,

Fig. 3-B
Slightly higher power magnification.

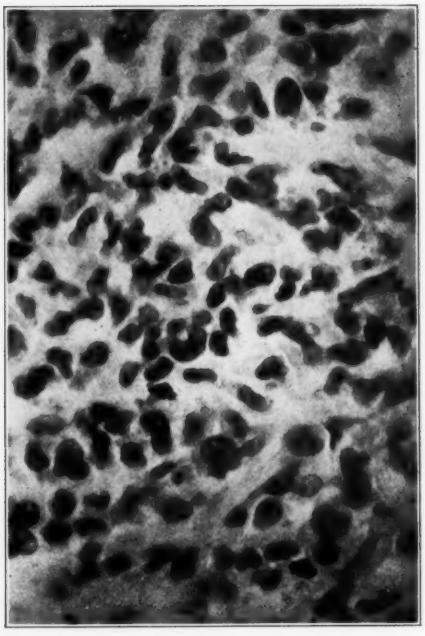

Fig. 4
High power magnification (1200), showing characteristic indented, lobulated, sausage and kidney-shaped nuclei.

Sabin and Doan.[6] These observers recognize three types of leukocytes, each arising from a common mesenchymal rest and stem cell. The granulocyte arises from the myeloid tissue in the bone marrow, the lymphocyte from the lymphatic tissue in lymph nodes, spleen and diffuse lymphoid tissue of the body and the monocyte in the connective tissue from the so-called histiocyte of the reticulo-endothelial system. From this point of view, there would therefore be as a result three respective types of leukemia.

Clough, Isaacs,[9] Doan,[6] Wiseman[10] and others believe that monocytic leukemia is a disease entity. Kracke,[11] Naegeli[3] and others believe it to be but a phase of myelogenous leukemia. Downey[12] has gone further and divided monocytic leukemia into two types, namely: the Schilling type and the Naegeli type. By the former he means the true monocytic leukemia with a predominance of monocytic cells in the blood stream and by the latter the mere monocytic phase of a myelogenous leukemia.

The Literature.—Obviously, because of this uncertainty, both concerning the origin of the monocyte and the actual existence of a monocytic leukemia, an accurate review of the literature is impossible. Mercer[13] attempted to do this and in addition to reporting two cases was able to collect five others from the literature. These cases were proven by correlation of the blood and histologic findings. Other cases have been reported by Payenneville and Cailliau,[14] Morgan, Yin T'ang Hsu,[15] Mitchell,[8] Whitby and Christie.[16] Hamilton Montgomery, of the Mayo Clinic, will soon report two additional cases. From the above it must be quite obvious that monocytic leukemia cutis is not the rarity which it was formerly believed to be. Numerous cases have no doubt been reported under such names as acute myeloid, stem cell, lymphoid, or mixed cell leukemia, large cell lymphoblastoma, leukosarcoma, and perhaps numerous others. Mercer discusses eleven such cases taken from the literature. Two more cases can be added to this list, one by Puhr[18] and another by Berger and Vallee.[19] Greater persistency and more careful searching will perhaps reveal additional cases.

The Cutaneous Lesions.—Mercer,[13] from a careful study of his own cases, was able to classify cutaneous manifestations of monocytic leukemia into two types: the macular and papular type which simulates a secondary syphilide, and the shotty papular and nodular type in which the lesions lie deeper in the corium. The former have red dots and bluish lines superimposed, and as the erythema subsides, the lesions become slate-blue and assume an induration. The latter enlarge, become more indurated, and show central softening and ulceration. He also mentions petechial-like lesions of the skin and mucous membranes. These are no doubt toxic, non-specific manifestations, although Whitby and Christie[16] have recently reported a case in which the purpuric lesions became necrotic and the histologic picture revealed a typical monocytic infiltration in the corium. A most interesting and unusual feature of the eruption noted by Mercer[13] was also present in our case, namely: the visible change in the size and color of the nodules from day to day. This may be related to fluctuations in the peripheral blood and cellular changes in the nodules, and will be alluded to later. Most of the reported cases of monocytic leukemia cutis have presented generalized subcutaneous papules and nodules, which, although varying as to size, consistency and tendency to ulceration, have usually at some stage in their evolution possessed a bluish grey color. In spite of the fact, however, that there

may exist some similar cutaneous findings in these cases, it is not yet possible to diagnose monocytic leukemia by these cutaneous manifestations *per se*. Neither is it possible to group these lesions into two distinct types other than perhaps specific and non-specific. There is no doubt concerning the importance and existence of the two types of lesions described by Mercer.[13] It is questionable, however, whether they are sufficiently characteristic to be diagnostic or pathognomonic of this disease. Cutaneous manifestations of monocytic leukemia, other than those described above, have been reported (Morgan, Yin T'ang Hsu,[15] Whitby and Christie[16]). It is felt that any type of lymphoblastoma can produce cutaneous manifestations similar to those described in monocytic leukemia. Certainly such nodules have been seen in myelogenous leukemia, Hodgkin's disease, and even in melanoblastomas. In fact, in the present case a clinical diagnosis of myelosis of the skin was at first entertained, and it was only after careful hematological and histological studies that a diagnosis of monocytic leukemia could be made. It is likely that as monocytic leukemia is more accurately recognized, there will probably be seen a considerable diversity of cutaneous manifestations. In monocytic leukemia, as in other leukemias, these cutaneous manifestations may precede, accompany, or follow the hematological recognition.

Forkner[24] believes that monocytic leukemia can be differentiated from the other leukemias on clinical findings alone. Doan and Wiseman,[10] Haining, Kimball and Janes[20] and others do not share this opinion. The former contends that although one finds bleeding of the mucous membrane in all leukemias, this only progresses to ulceration and gangrene in the monocytic type. He also feels that the spleen is usually enlarged and that although one may have a generalized lymphadenopathy, the lymph nodes in and about the neck show the most extensive involvement and are often the only ones to hypertrophy.

In this regard, there were some very interesting clinical features in the case herewith reported. The anterior and posterior cervical, the submaxillary and the submental glands showed the most extensive involvement. There was also a severe gangrenous stomatitis which necessitated surgical intervention. The spleen, however, was not palpable and the total white blood count never reached beyond 18,050 and on several occasions was entirely normal. This is not particularly unusual, such cases having been reported by others (Bykowa[21] and Orr[22]). It does, however, emphasize the fact that a diagnosis of leukemia must be made on cell morphology and that a splenomegaly, enlarged lymph nodes and leukocytosis are not necessary accompaniments of the disease.

Weil and Isch-Wall[23] and others have noted that the prognosis in cases of myelosis of the skin is poor; that the patients rarely live longer than a few months after the appearance of the nodules. This has also been true in most of the cases of monocytic leukemia, and certainly in our case the cutaneous outbreak was soon followed by fatal termination.

Hematological differentiation of the leukemias is discussed at length in articles by Clough,[4] Farrar and Cameron,[7] Forkner[24] and others, and a detailed account will not be given here. We agree, however, with Haining, Kimball and Janes[20] that a diagnosis of monocytic leukemia can usually be made by a competent hematologist from a Wright's smear alone; although supra-vital and granule stains are not to be deprecated, and are often of definite value. In addition to the cell type, which have previously been described, the following facts are worthy of note. There is usually present a secondary anemia and a monocytic leukocytosis, although a-leukemic or sub-leukemic phases exist. The oxidase reaction varies in these cells. Some take the stain and some do not. When the granules are present, however, they are smaller and less frequently found than in myelocytes. Some hematologists lay much emphasis on this and consider it most important in differentiating these two types of cells.

Biopsy.—The biopsy is of paramount importance in the diagnosis of monocytic leukemia when cutaneous nodules are present. The histologic sections in this case have been examined by several well qualified men and opinions have differed. One pathologist stated that the cells were different from those of any leukemic infiltration he had ever seen and added that they impressed him as being of reticulo-endothelial origin. Another pathologist, reluctant at differentiating between the various primitive blood cells, diagnosed the condition as a hemocytoblastoma. Dr. Udo J. Wile reviewed the section and stated that he had never seen anything like it; that the cells were not myelocytes, and that the diffuse character of the infiltrate was especially striking, quite unlike the dense structure of a lymphoblastoma.

In the particular case under consideration, it is felt that after careful study a definite differentiation from myelogenous leukemia can be made, and that the cells conform to those of monocytic leukemia. If there exists a Schilling type, in which the cells are of endothelial origin, and a Naegeli type, which merges with myelogenous leukemia, it is quite likely that this case fits into the former classification. The general distribution of the infiltrate is somewhat different from that usually found in myelogenous leukemia. In the latter this occurs for the most part in the upper layer of the corium, and where definite nodules have occurred this infiltrate is extensive, dense, and often simulates the structure of a lymph node. In this case there is a diffuse infiltrate extending deep into the subcutaneous tissue, and between the connective tissue fibers. The cells appear to have infiltrated between these fibers rather than to have replaced them, as often occurs in myelosis of the skin.

Morphologically, these cells can usually be distinguished from myelocytes by their indented, lobulated, kidney-shaped nuclei and their irregularly shaped cell bodies with pseudopods. Practically every microscopical field contained numerous cells with these characteristic nuclei, whereas few, if any, are noted in cases of myelogenous leukemia (*Fig. 5*). In Barney's[25] case of myelosis of the skin, however, there were areas of the infiltrate which contained cells similar to the above, and which he classified as endothelial in origin. It is more difficult to distinguish young monocytes and monoblasts from myeloblasts. However, the chromatin in the nuclei of the former is coagulated into fine granular masses instead of being reticular as noted in myeloblasts. Then again the close association of these cells with numerous typical adult monocytes is further evidence in favor of their being monoblasts.

The peroxydase reaction was negative and although of particular interest, was of little practical value. This has been the experience of many others. This chemical reaction merely represents the presence of granules and all blast forms of any cell type are oxydase negative. Thus a positive reaction would rule out all blast forms and lymphocytes; but a negative test would not eliminate young forms of either the monocytic or myelocytic series.

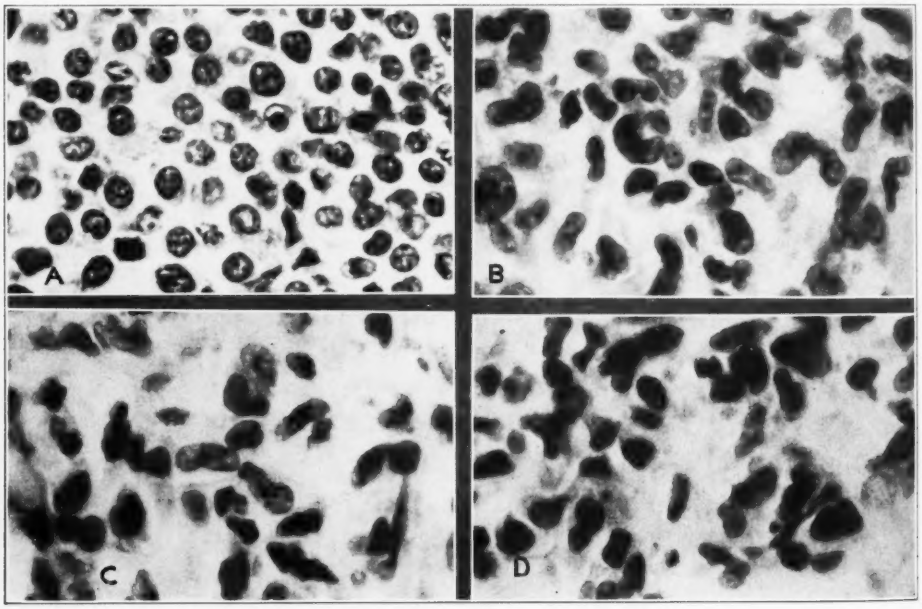

Fig. 5

(A) Myelogenous leukemia cutis (X1200). (*Courtesy of Dr. Udo J. Wile.*)

(B, C, D) Monocytic leukemia cutis (1200 mag.). Three different fields. Note large lobulated kidney-shaped nuclei and contrast with round vesicular nuclei of A.

It is quite likely that the cellular content of the nodules varies from time to time. That this may occur is shown by a second biopsy taken from a different nodule two weeks after the first. Here the infiltration was much less diffuse, being present for the most part about the vessels, nerves and sebaceous glands. In fact, this particular histologic picture was much more characteristic of cases previously reported than was our first biopsy, the infiltrate of which was much more extensive and diffuse. The cells of the second biopsy contained large, oval nuclei and few cells with lobulated, kidney-shaped nuclei were seen. These cells were peroxidase positive and were no doubt older cells than those present in our first biopsy. Had this been the sole biopsy and had we not been able to correlate blood morphology, it would have been more difficult to distinguish these cells from those of the myelocytic series regardless of the theoretical differentiation.

It is generally known that the blood picture varies extensively in leukemia. Many authors have reported one type of leukemia merging into another. Pathologists claim that occasionally different portions of the same lymph node reveal different lymphoblastomatous pictures. Cutaneous mutations of the lymphoblastomas have likewise been reported (Wile and Stiles[26]). In our case there occurred a most interesting and somewhat similar condition. Two nodules removed within two weeks of each other revealed a different type of cell in regard to developmental stage. It is suggested that in the future frequent biopsies be made; that the cell type be carefully determined and compared with blood smears taken concomitantly. Observations and studies along these lines might determine whether such cells are produced *in situ* or brought to the skin by the blood stream.

SUMMARY AND CONCLUSIONS

(1) A case of monocytic leukemia with subcutaneous nodules is reported.

(2) Histologic examination of these nodules revealed the same type of cells as those found in the peripheral blood.

(3) In the case herewith reported the histologic picture was sufficiently distinctive to permit a diagnosis of monocytic leukemia cutis.

(4) Although the cutaneous pathology may occasionally be diagnostic, correlation of clinical, hematological and histological features is usually necessary to establish such a diagnosis.

(5) Evidence is presented to support the view that monocytic leukemia is a definite leukemic entity.*

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*For the privilege of presenting this case I am indebted to the Department of Internal Medicine of the University of Louisville School of Medicine.

I should also like to express my appreciation to the Department of Pathology for its assistance in the preparation and description of the histologic sections.

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The photomicrographs, except Fig. 3, were made by Mr. John Homan, of the Department of Medical Art of the University of Cincinnati Medical School.

DISCUSSION (*Abstract*)

Dr. Chas. O. King, Birmingham, Ala.—The acceptance of monocytic leukemia as a clinical and pathologic entity involves recognition of the validity of the newer conception of the derivation of the circulating monocytes directly from the reticulo-endothelial tissue. Diagnosis depends upon the accurate identification of the predominant cells in the blood. This is based on the morphological characteristics of the nuclei, cytoplasm and cytoplasmic granules, on the usually negative oxidase reaction and particularly on the evidences of motility and phagocytic activity. As we review the paper, two questions at once suggest themselves: first, was this actually a case of leukemia, and second, are the abnormal blood and tissue cells monocytes? My principal excuse for raising the first question is the fact that in some quarters there have been doubts as to whether there is in fact such a disease entity as leukemia of any sort or variety. According to such view, it might be argued that we are dealing here only with some overwhelming infection such, for example, as might in its milder manifestations constitute the syndrome of acute glandular fever or infectious mononucleosis. I raise the objection, however, merely to dismiss it. Actually, I see no reason to doubt that this was a case of acute leukemia.

The second question is harder to answer. In fact, the exact differentiation of the leukemias has been a source of controversy ever since the disease was first recognized. At first all leukemias were regarded as lymphatic. Then Naegeli differentiated the myeloid variety. Then the difficulty sometimes met with in differentiating the two types led to the belief by some writers that there might be a leukemia of mixed type in which cells of both lymphoid and myeloid origin might be present in the blood. The term mixed cell leukemia passed out of fashion long ago. By some the difficulties that gave rise to the term could be answered very easily by the assertion that both cell types have a common origin, anyway.

Now comes the question of monocytic leukemia. The monocyte is the transitional cell of Ehrlich, but better known to most of us as the large mononuclear of the circulating blood. Its relationship to the so-called histiocyte is not quite clear, but one or both of them appear as active leukocytes in the tissue where they have been called by a variety of names by different observers. Their pedigree is uncertain. Many different sites of origin have been assigned to them by different observers. In a recent paper Forkner lists nineteen such sites or relationships. According to Sabin and her collaborators, Cunningham and Doan, the cell must be stained supravitally to bring out its distinguishing characters. Comparison of the colored plates illustrating recent articles by Clough and by Doan will show that there is not entire agreement even amongst expert hematologists as to the appearance of the typical cell. Such differences of opinion probably explain the fact that Rosenthal (J.A.M.A., March 2, 1935), in summarizing 455 cases of leukemia, finds 7 cases of acute monocytic and two of chronic form, giving him a total incidence of 1.9 per cent, while Doan and Wiseman (*Annals of Internal Medicine,* October, 1934), find 12 cases in a total of 76, that is, 16 per cent, in their series.

It is generally admitted that myeloid cells appear in the blood in monocytic leukemia just as they did in the present case. Not infrequently the myeloid cells have increased at the expense of the monocytes so that the blood has taken on all the appearance of a typical myeloid leukemia. Or a monocytic phase has appeared either early or late in the course of an evident myeloid leukemia. Such variation has been emphasized by Naegeli and used as an argument against the acceptance of a monocytic leukemia as a separate type. The present case is extremely interesting from this angle because, while the original skin nodule contained infiltrating cells identified by different pathologists as monocytes, there seems to have been reason for believing that the second nodule contained not monocytes but myelocytes. Dr. Loveman has very appropriately called attention to the implications of this puzzling circumstance.

LOW BACK INJURIES WITH PARTICULAR REFERENCE TO THE PART PLAYED BY CONGENITAL ABNORMALITIES*

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It is common knowledge that trauma to the lower back at times produces results which seem far out of proportion to the injury sustained. Furthermore, the resulting disability is too frequently a prolonged one, often ending in complete incapacity. This is particularly true in industrial surgery, in the practice of which trauma to the back, the result of occupation or accident, constitutes one of the most difficult types of case encountered so far as diagnosis and restoration of function is concerned. In recent years such injuries have so increased in frequency that the so-called "low back problem" has become a very important one and its solution a most desirable goal; consequently, the past ten to fifteen years have seen extensive investigations being carried out in an effort to reach a solution. These investigations have demonstrated conclusively that the successful management of low back injuries must have as its foundation an understanding of the pathologic condition present, and have shown that a very complex pathology may be looked for in low back injuries, especially in the chronic or residual case. One aspect of this type of pathologic condition, congenital abnormalities, will be dealt with at this time.

Low back injuries may be grouped for convenience into those which respond to treatment

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and get well and those which do not respond to ordinary methods of treatment and become the chronic or residual case with serious or complete disability. It is this second group which constitutes the "low back problem." The importance of these residual cases of low back injury has stimulated an intensive study of this group along many lines with the object of discovering the reasons underlying failure to recover. Probably the greatest advance which has been made in our understanding of the pathology responsible for persistent low back symptoms has come through information gained by better and more intelligently interpreted x-ray studies of this region. Such studies have disclosed among a number of facts that the lower back is the site of a variety of osseous congenital defects which create definite architectural weaknesses in this region. Such architectural weaknesses have come to be considered an important factor in the pathology of low back conditions, particularly the chronic type, and it is the manner in which they act and their treatment that I wish to discuss. The observations offered are based on the study of 929 cases of low back injury examined in our clinic.

The two regions most commonly involved in low back injuries are the lumbosacral joint and the sacro-iliac articulation. Congenital osseous defects are most frequently found in the fifth lumbar vertebra and the first sacral segment, which form the lumbosacral joint. They are seldom encountered in the sacro-iliac joint. This discussion which deals only with congenital abnormalities will therefore include only the lumbosacral joint. It is an interesting fact in this connection that in our experience and that of many who see a large number of low back cases, those in which symptoms are referable to the lumbosacral joint far outnumber those in which the symptoms point towards involvement of the sacro-iliac joint. In our series of cases it has been almost two to one in favor of the lumbosacral joint.

The lumbosacral articulation is a very important joint. Through this articulation the weight of the trunk and upper extremities is transmitted to the pelvis. In addition, it plays an important role in spinal movements; Goldthwaite states that fully one-half the motion of the trunk below the lower dorsal region is made in this articulation. Finally, the lumbosacral joint is the point of junction between the movable spine above and the more or less fixed pelvic girdle below; this means a joint subjected to considerable stress even under ordinary conditions. We have, then, a joint which must combine great strength with freedom of movement, a difficult combination. To meet these requirements a definite type of joint is needed and a brief consideration of its anatomy will be worth while.

Anatomy.—The lumbosacral articulation in its main part inclines downward and forward about 42.5° in the upright position, and were it not for the presence of supporting structures, the fifth lumbar vertebra would slide forward on the sacrum. These supporting structures are the articular facts of the sacrum into which the lower articular processes of the fifth lumbar vertebra fit, and the supporting ligaments. The articular facets face practically inward and outward (*Fig. 1*) with a slight convergence toward the front which blocks any slipping forward of the vertebra above on the vertebra below. The ligaments, particularly the iliolumbar (*Fig. 2*), which passes from the body and transverse processes of the fifth lumbar to the iliac crests, afford considerable support, but would soon become stretched and lose their supporting qualities if the major portion of the work was not done by these bony articular processes.

As was said, there is considerable motion at this joint, but chiefly in the direction of flexion and extension. In flexion, the motion at the lumbosacral joint is made partly by change in the shape of the intervertebral disc, but chiefly by the slipping upward of the articular processes

Fig. 1
Sacrum, showing normal sacral facets.

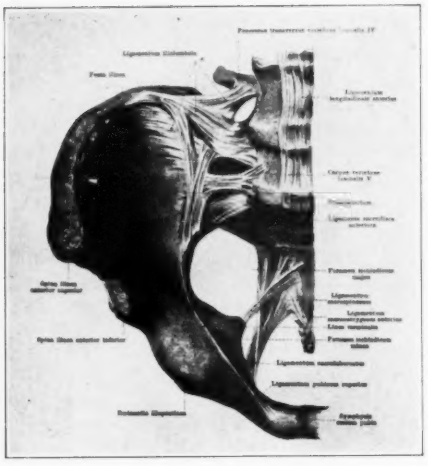

Fig. 2
Lumbosacral ligaments.

of the fifth lumbar on the opposing processes of the sacrum. With a joint acting in this manner, it is possible that if flexion were carried too far the articular processes of the fifth lumbar might slip entirely off those of the sacrum, allowing it to slide forward and a condition of spondylolisthesis or partial spondylolisthesis might be produced. With the strength of this articulation and its supporting ligaments, it is almost inconceivable that such a displacement either bilateral or unilateral could occur even to a minor degree without fracture, unless there were factors present which would tend to weaken the joint, decrease its stability and render it more vulnerable to injury. It is the part played by congenital abnormalities in producing such a weak architecture at the lumbosacral joint that I wish to emphasize in considering injuries to this region.

Congenital osseous abnormalities of the spine of a developmental character are not uncommon and the most usual site for them is in the lumbosacral region. George, in his valuable contribution on this subject, says that 35 per cent of all spines x-rayed in his laboratory for any purpose showed congenital abnormalities in the lumbosacral region. Apparently fully 50 per cent of these abnormalities exist without symptoms and the individual is unaware of their presence. Any considerable variation from the normal, however, must be taken into consideration as a possible factor in causing structural weakness of the lumbosacral articulation and therefore is looked upon as a very definite pathological entity.

A critical analysis of the low back cases in our clinic which have been diagnosed injuries to lumbosacral articulation has led us to conclude that there are a variety of congenital defects which could be considered factors in causing structural weakness in this region. There are, however, five which seem particularly important so far as we can determine, since they occur most commonly in our series of cases. These are:

(1) Increased angle of the lumbosacral junction (increased sacral inclination), 31.3 per cent
(2) Defective articulation between the fifth lumbar and the sacrum, 22.5 per cent
(3) Sacralization of the fifth lumbar vertebra, 17.6 per cent
(4) Spina bifida occulta of the first sacral segment, 12.2 per cent
(5) Spinal clefts, 2.26 per cent

Increased Sacral Inclination.—Increased sacral inclination, while at times causing nothing more serious than a postural backache, must in the light of conclusions arrived at by studying a large number of lateral views of the spine, be considered a congenital abnormality of the lum-

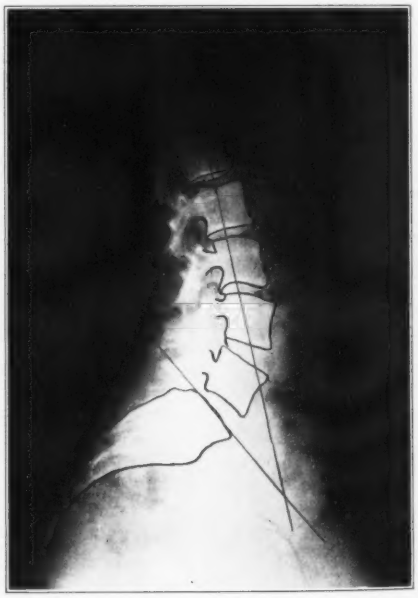

Fig. 3
X-ray of spine showing increased sacral inclination.

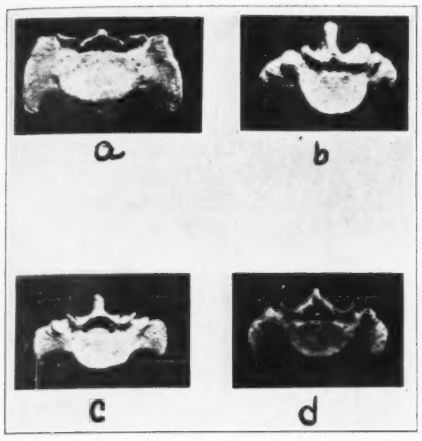

Fig. 4
Abnormal facets: (a) flat articular processes; (b) combined flat and cresentic articulations; (c) and (d) cresentic articulations.

bosacral region. With the normal sacral inclination, we have the lumbosacral joint at a mechanical disadvantage, as the fifth lumbar vertebra rests upon the top of the sacrum at an angle of 42.5°. If we now increase the sacral inclination until the plane of the lumbosacral joint is a right angle, or even an acute angle (*Fig. 3*), as it is in some cases, it is obvious that there will be a tilting forward of the articular processes of the sacrum and as the result of this the stability of the articulation between the fifth lumbar vertebra and the sacrum, so far as bony support is concerned, may be greatly reduced and the major part of the work of sustaining the fifth lumbar vertebra be thrown upon the ligaments. With such a weak architectural arrangement it is not difficult to appreciate that if this joint is subjected to undue stress or strain the ligaments may readily be stretched or ruptured and severe local damage may be done. It is even conceivable that, deprived of the checking section of the supporting ligaments, there may occur an actual subluxation of one or both of the lumbosacral articulations. I do not believe, however, that such an actual dislocation or spondylolisthesis occurs in this way; spondylolisthesis is due to a different type of congenital defect. However, once damage has been suffered by such a structurally weak joint, it is certain that recovery will be slow and perhaps never complete. In 31.3 per cent of our cases this condition was considered the underlying pathologic condition, not only in predisposing the lumbosacral joint to injury, but in the persistence of symptoms.

Abnormalities of the Articular Processes.—Goldthwaite first called attention to the variations in form of the articular processes of the sacrum, which occur as congenital abnormalities. He described two basic types (*Fig. 4*): the strong crescentic articulation with the lateral portion extending backward almost at right angle with the anterior transverse part and the weak, flat articulation with its axis nearly transverse. The crescentic type is the normal form and is splendidly adapted to furnishing strong support for the fifth lumbar vertebra; the flat type is abnormal and by its weakness of construction provides definitely less support to the fifth lumbar, permits a much greater degree of mobility and is altogether much less stable than the normal type, especially if in addition to its flatness it has a decided forward inclination instead of the normal vertical position. It is very difficult to determine the presence of such abnormal articulations by x-ray and frequently it is necessary to arrive at conclusions as to this condition by the appearance and position of the fifth lumbar vertebra. We have been able, however, to inspect a number of these flat articula-

Fig. 5
Sacralized fifth transverse process.

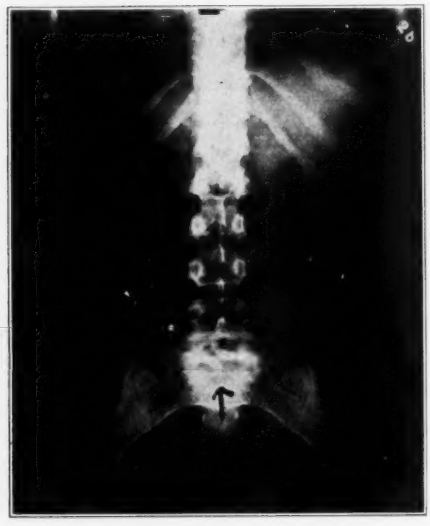

Fig. 6
X-ray of spine showing spina bifida occulta of first sacral segment.

tions at operation and have been convinced of the instability that results. In 22.5 per cent of our cases this was diagnosed as the pathologic condition most probably present and while we have been unable to prove all by actual inspection, about 35 per cent of those so diagnosed have been confirmed at operation. This condition has been found associated with other congenital abnormalities quite frequently.

Sacralized Transverse Processes.—The transverse processes of the lumbar region vary greatly. Some are short and thin; others large and thick. The large transverse processes may at times extend so far laterally and be so shaped as to impinge upon the top of the sacrum or the ilium; at times they are completely sacralized (*Fig. 5*). Such sacralized fifth lumbar vertebrae introduce an abnormal architectural design in the lumbosacral region which may, under conditions of stress, conceivably produce symptoms in one of three ways. First, a unilateral sacralization may introduce a distorted leverage force in the lumbosacral joint when certain movements are made; second, there is often a very inefficient joint between the sacralized process and the sacrum, which is readily irritated because of its structural insuffiency; third, narrowing of the intervertebral foramen between the fifth lumbar and the sacrum, under proper conditions of posture or movement, may allow of impingement of the fifth lumbar nerve with sciatic pain. Such sacralized fifth lumbar vertebrae occurred in 17.6 per cent of our cases.

Spina Bifida Occulta and Lateral Clefts.—These conditions may be discussed together, since they are both due to a faulty ossification of the fifth lumbar vertebra and first sacral segment.

In spina bifida occulta (*Fig. 6*) we have incomplete closure of the neural ring. When this condition involves the first sacral segment, it has been our experience that it is usually associated with a rather loose union between the first and second sacral segments, at least posteriorly; this union is so insecure that frequently at operation the first sacral segment may be grasped in forceps and moved extensively from side to side. The result of this combination, since it is the first sacral segment which enters into the formation of the lumbosacral joint, is a very insecure and weak articulation with great potentiality for giving rise to trouble when subjected to strain. Spina bifida occulta occurred in 12.2 per cent of our cases.

In lateral clefts we have failure of the lateral masses of the fifth lumbar vertebra to unite so that the vertebra remains separated into two distinct parts connected by fibrous tissue only (*Fig. 7*). Lateral clefts in the fifth lumbar ver-

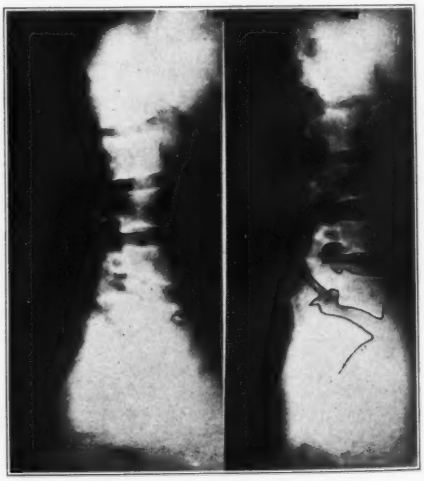

Fig. 7
X-rays of spine showing spinal clefts.

tebra produce a definite instability, since they permit of independent action of the upper and lower articular processes of the vertebra instead of a simultaneous one and also permit of false motion at the cleft; in other words, such clefts permit of considerable abnormal play between the segments of which the vertebra is composed. As evidence of what may occur in such a vertebra, we find occasionally that even under the stress of ordinary use the fibrous tissue composing the clefts yields and stretches and a gradual slipping forward of the body of the fifth lumbar vertebra takes place and a true spondylolisthesis occurs. Sir William Turner, in his monograph on the human skeleton in the *Challenger Reports*, states that spinal clefts existed in .5 per cent of all the subjects examined. Such clefts were found in 2.26 per cent of cases of our series. It is probable, however, that many have been overlooked in the earlier cases because of inadequate roentgenograms.

With spina bifida occulta of the first sacral segment or spinal clefts of the fifth lumbar we have a lumbosacral joint of definite structural insufficiency. If such a joint is subjected to increased stress from trauma it may give way at its weak point and damage be done which it is difficult to repair, with resulting persistence of symptoms.

These five types of abnormality of the lumbosacral region are, so far as our experience goes, those most frequently present in patients giving a history of persistent low back symptoms following injury. Many different opinions are held upon the importance of the part played by congenital abnormalities in the causation of persistent low back symptoms. There are those who would ascribe to one or the other of them most of the blame; there are those who would deny that any of them play a role of importance. Our experience leads us to believe that if we eliminate such conditions as arthritis, general toxic conditions, tuberculosis and neoplasms, osseous congenital defects will be found to be present in most of the low back injuries presenting a history of long-continued disability. Certainly the association of such abnormalities and persistent symptoms would seem so important a feature of the pathology as to demand careful consideration. In our own series of persistent low back cases diagnosed lumbosacral, 85.5 per cent had some form of congenital osseous abnormality at the lumbosacral junction. Myron O. Henry, in a recent paper analyzing one hundred consecutive low back cases, found that 80 per cent had congenital abnormalities of this region.

Diagnosis.—The symptoms which result when such architecturally weak spines as we have been discussing are injured do not as a rule differ from those produced by other causes. Time will not permit of a detailed consideration of the symptom complex, but there are five signs which should make us strongly suspect a congenitally weak spine. These are (1) persistent dull pain in the lower back referred into both buttocks, often coming on after standing or sitting for a length of time and increased by subsequent activity; (2) persistent local tenderness in the region of the lumbosacral articulation and iliolumbar ligaments; (3) definite onset of pain on either extreme hyperextension or hyperflexion of the spine; (4) feeling of weakness and insecurity in the lower extremities; (5) bladder symptoms such as frequency of urination or a definite residual urine usually from 200 to 300 c. c., a condition resembling "cord bladder."

I should like, under diagnosis, to make a definite plea for a careful x-ray examination of the spine in low back injuries and a more intelligent study of the plates when taken. An adequate roentgenological examination of the spine or lumbosacral joint should include a clear anterior posterior view, stereoscopic if you wish, and two lateral views, one with the spine completely extended and one with the spine completely flexed. Often what seems to be a normal spine in one position becomes a definitely abnormal one in another position and unless plates are taken to show the spine in all positions, information of great importance in diagnosis and treatment may be missed.

The making of a correct diagnosis is not always easy, but a careful history, a painstaking examination with a proper understanding of symptomatology and finally good x-ray pictures taken in the anterior posterior and lateral planes, interpreted with an understanding of the possibility of abnormalities involving this region, should enable one to make a fairly accurate diagnosis, give a prognosis based on the underlying pathologic cause and lead to the institution of result-producing treatment.

Treatment.—In considering the treatment of cases of lumbosacral injuries, we believe it should be clearly borne in mind that such injuries involve two types of joint: the normal and the abnormal. It is felt that a very different attitude must be taken toward a normal and an abnormal lumbosacral joint as regards both

Fig. 8
Pelvic traction on Bradford frame.

prognosis and treatment. Injuries to normal spines, including the lumbosacral joint, form the bulk of the back injuries both in industry and in ordinary civil life, and these should, with adequate treatment, pursue a normal course to recovery, just as a sprain or strain of any normal joint does, with this difference: such back injuries will be slower in recovery because of the greater difficulty in giving them adequate fixation. In injuries to the abnormal spine (lumbosacral joint) we cannot in the majority of cases expect such a normal convalescence. We are dealing with a structurally weak joint which is capable of functioning under ordinary conditions quite satisfactorily; when, however, such a joint is injured, it will rarely return to anything like its former condition of usefulness and frequently the result is a more or less incapacitated individual, incapable of returning to an occupation which requires much physical exertion. This difference must be clearly distinguished and kept in mind in outlining a plan of treatment for injuries to the lumbosacral region.

Let us first consider the treatment of an acute case. Remembering that an injury in this region has possibilities of being a very disabling one, the patient should be put to bed and x-rays should be made in the anterior posterior and lateral planes. A careful examination should then be carried out, taking into consideration the x-ray findings and the seriousness of the injury estimated. If the spine is a normal one and the injury unimportant, adequate strapping with adhesive is sufficient. If the spine shows a congenital abnormality in the lumbosacral joint or if the injury is evidently an extensive one in a normal spine, as complete immobilization as possible should be given to the lower back region until the acute symptoms have subsided. When this has occurred definite, purposeful measures aimed at restoring mobility and function should be instituted. We believe that complete immobilization is best secured by recumbency in bed on a Bradford frame combined with pelvic traction (*Fig. 8*). At times a plaster body cast must be used, but it is our belief that the use of casts should be avoided as far as possible, since absolute fixation of this type tends to prolong the period of recovery. Physical therapy in the form of heat, massage and mild active exercises, gradually increased, except in arthritic cases, should be used to restore flexibility to the spine and build up muscle control. When the time arrives for the patient to become ambulatory an adequate back-abdominal support should be supplied (*Fig. 9*). This should be worn for several months.

In the residual case our problem is somewhat different, since this group includes those individuals who, because of inadequate or unsuccessful treatment, have a condition which has passed from the favorable state of acuteness into the unfavorable state of subacuteness or chronicity. In these residual cases conservative measures such as have been mentioned should be carried out, provided these have not already been used, with the addition of such constitutional measures as a thorough physical examination may indicate. Constitutional measures should include removal of focal infection, sources of toxic absorption and building up the resistance of the individual in every way possible. Even in the subacute and chronic cases the results of conservative treatment are frequently most gratifying if persisted in.

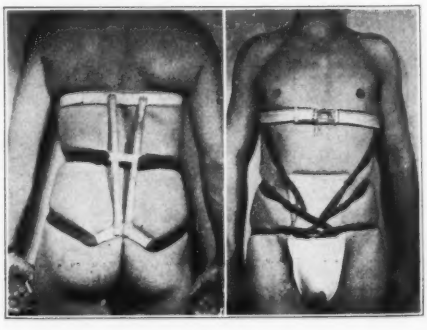

Fig. 9
Ambulatory low back support.

There are, however, a considerable number of low back injuries which are not relieved by any form of conservative treatment. Our experience has been that if we segregate from this group the arthritic cases most of the residual cases of low back disability will show in some degree one of the osseous congenital defects we have been discussing. When definite evidence of such architectural weakness is found combined with persistent symptoms and partial or complete disability and if adequate conservative measures have been tried and failed, then there is real justification for abandoning conservative treatment and turning to operative treatment for relief. Our experience in residual cases of this type has been that operation is the only form of treatment which promises relief which will be permanent. If we have a fifth lumbar vertebra or first sacral segment which is structurally weak by reason of osseous congenital defects and so incapable of functioning properly, its elimination as a movable vertebra by converting it into a fixed sacral vertebra through operative fusion is a logical procedure. By doing this we eliminate the weak and spmptom-producing lumbosacral articulation and throw the burden of its work upon the articulation above, which is rarely weak and usually capable of assuming quite readily the function of the eliminated joint. Furthermore, once the indications for operation are demonstrated, it is our feeling that procrastination gains nothing, but, on the contrary, does distinct harm in that the longer the period of disability and incapacity, the more difficult is the return to normal and the greater the danger of an unfavorable psychic element's entering into our problem.

Forty-three lumbosacral fusions have been performed in our clinic during the past six years, all for congenital defects. Of these, three are too recent for any conclusions to be drawn as to the result. Of the remaining forty operations, thirty-nine have resulted in relief of symptoms and return to ordinary activity, giving a percentage of 97 successful results. This is a very satisfactory average, since all cases were of long standing and with a definite degree of disability.

In conclusion, may I summarize briefly the conclusions we have arrived at from a study of these 929 low back cases. Unquestionably osseous congenital defects are not the sole cause of persistent low back symptoms. The presence of a demonstrable abnormality capable of causing structural weakness of the lumbosacral joint is, however, of sufficient significance to demand a most careful evaluation of its relation to the production of symptoms and the resulting disability both from the point of view of diagnosis and the selection of the method of treatment to be carried out.

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BONE SYPHILIS*

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The incidence of bone syphilis is sufficiently frequent to make it important in relation to railway and industrial surgery. Familiarity with the common lesions of bone syphilis will frequently save errors in diagnosis, and early recognition of these lesions when present will shorten the periods of disability. It is difficult to form an exact estimate of the incidence of bone syphilis for, unless the patient is having some symptoms of osseous lesions, no examination is usually made of the skeletal system. It is known, however, that there are many types of quiescent bone lesions which, unless accidentally discovered, would have cleared up unrecorded.

Stokes says that clinical experience has shown that few patients escape some degree of reaction in the osseous system during the course of their general infection. While the bone lesions recognized clinically as syphilis usually appear in the tertiary stage, the skeletal structures offer no barrier to involvement in the primary and secondary stages of syphilis. This is evidenced by the pain, either dull aching or acute in character, frequently seen in the secondary stage and usually localized in the long bones or skull. Examination reveals a deep tenderness, probably due to medullary involvement, or occasionally areas of exquisite tenderness suggesting a cortical or periosteal lesion. The roentgenologic examination in such cases is negative, as the infection has not produced sufficient changes in the bony structures to be evident in the roentgenogram.

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Fig. 1

Extensive syphilitic osteomyelitis of the ulna. The prevalence of syphilitic lesions in the superficial bones suggests the importance of repeated minor trauma in the localization of the process.

Wile and Senear, in a survey of 165 cases of syphilis in the primary or secondary stage, demonstrated evidence of bone or joint involvement in 60 cases. An estimate of the incidence of bone syphilis encountered in the usual orthopedic practice may be obtained from our records at Campbell's Clinic, which show 150 cases of proven bone syphilis, an incidence of one-half of 1 per cent of the total admissions.

It is also perhaps of interest to know that the bone lesions of syphilis have played an important role in tracing the early history of the disease. Most authors agree that syphilis was unknown, certainly unrecorded in literature, before the latter part of the Fifteenth Century.

The first authentic descriptions date from 1495 following the return of the sailors from Columbus' expedition to the West Indies. Following this there was a definite epidemic of syphilis throughout Europe. That syphilis was unquestionably present on the American continent in pre-Columbian times is amply substantiated through evidence discovered by reliable archaeologists and anthropologists who have found and described bones that undoubtedly show evidences of syphilitic lesions. These bones belong to an era well before the time of Columbus and have been found scattered from Ohio to South America.

Similar investigations carried on in Europe have failed to show any authentic cases of bone syphilis in the skeletal remains which date before the return of Columbus' expedition. Consequently, it is generally admitted that in all probability syphilis has existed on the American continent for an indefinite period of time and was introduced into Europe by the Columbus expedition.

Age Incidence.—Like many other bone diseases, such as acute pyogenic osteomyelitis, the majority of bone lesions in syphilis occur before the fifteenth year, but they are by no means limited to that period.

Location of Bone Lesions.—The bones which lie superficially are apparently the most frequent

Fig. 2

Syphilitic osteomyelitis occurring exactly at the site of a previous acute trauma. X-ray appearance and history resemble that of acute pyogenic osteomyelitis.

Fig. 3
Syphilitic lesion in metacarpal and phalanx following an acute fracture of the phalanx produced by a heavy object falling on the hand. Fracture united; disability prolonged by complicating syphilitic osteomyelitis.

sites of syphilitic lesions, the tibia, ulna, clavicle and skull being involved most often in the order named. Just what the explanation for this distribution is has not definitely been proven, but in all probability it has some relation to trauma, either as a single injury or the result of often-repeated minor contusions.

Pathology. — Various classifications of the types of bone syphilis have been given in the literature. Among these are such divisions as periostitis, osteoperiostitis, osteitis, epihysitis, osteochondritis and osteomyelitis, each classification being described as an individual entity. Such arbitrary divisions are misleading, for the evidence is conclusive that all of the various roentgenologic manifestations of bone syphilis are different stages of a single pathologic process.

Exactly the same confusion existed previously in regard to pyogenic osteomyelitis. It was not until the true nature of this disease was recognized as primarily a medullary infection, later involving the cortex and periosteal layers, that the various stages in the evolution of the pathologic process were understood. There is every reason from the clinical, pathologic and roentgenologic evidence to believe that syphilis is an infection of a similar nature, the primary infection originating in the medulla and later spreading by way of the blood vessels in the Haversian canals to the cortex and periosteum.

The whole process, therefore, should be classed as syphilitic osteomyelitis, the characteristics and extent of the various pathologic and roentgenologic manifestations being dependent upon the virulence of the infecting organism and the resistance of the bony structure. The latter will vary according to the age of the patient. It is well recognized that the young actively growing bone of infants and children is less resistant to infection of all types than adult bone. The *Spirocheta pallida* can usually be demonstrated in the medullary canal of all syphilitic fetuses and clinical experience has shown that at least 50 per cent of all children with congenital syphilis show osseous lesions at some stage of the disease.

Syphilitic osteomyelitis may be diffuse or circumscribed and may be evidenced by any one or a combination of all of the pathologic responses to bone infection. Periosteal or cortical proliferation and destruction, sclerosis, sequestration, epiphyseal separation and pathological fracture may be seen.

Roentgenologic Changes.—While it is well recognized that the bone lesions of syphilis may simulate any or all of the commoner bone diseases, there are certain characteristic changes

Fig. 4
Syphilitic arthritis following acute traumatic injury to the knee.

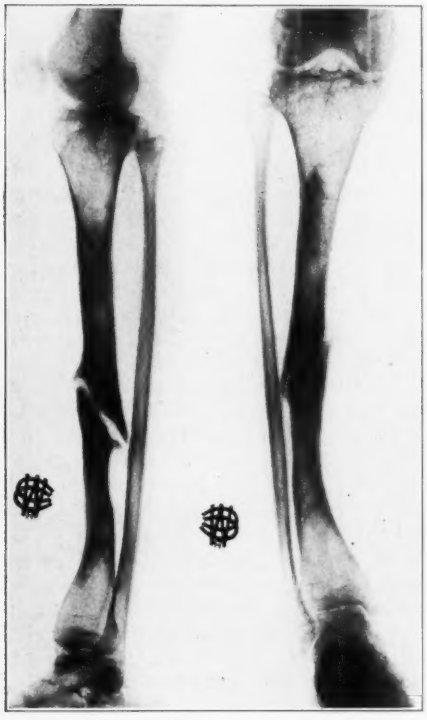

Fig. 5 (A)
Non-union of fracture of the tibia. Non-union produced by eburnated condition of the bone resulting from previously healed syphilis. Non-union is due to physical character of the bone and not to syphilis.

which appear with such frequency that they are almost diagnostic.

The earliest changes are usually seen as a proliferative reaction in the outer layers of the cortex, giving a hazy, fuzzy appearance to the normally clear-cut periosteal line. New bone is deposited irregularly or in parallel layers beneath the periosteum, producing a thickening of the shaft. This inflammatory reaction may be traced throughout the thickness of the cortex, as evidenced by a disturbance of the normal bony trabeculation and a reproductive reaction on the medullary side of the cortex with expansion causing a narrowing of the medullary canal.

As the process continues the periosteal line assumes an irregular bumpy contour with early evidence of necrosis and destructive lesions, both in the remains of the old cortex and in the new formed bone. Later, punched out areas of necrosis or gummata appear. These are surrounded by an infiltrated zone of increased opacity and frequently contain small sequestra. Gummata are destructive lesions, varying in size, often extending across the entire width of the shaft and so weakening the bone that pathological fractures occur. Ulceration and sinus formation may occur. In the more active and destructive types of syphilitic osteomyelitis an extension of these changes may produce unusual degrees of enlargement and distortion of the shaft so that in places it may become many times its usual size. The new structure is composed of intermingled areas of necrosis, infiltrated portions of increased opacity and reproductive areas of new bone formation. The bone adjacent to such a lesion shows thickening of the shaft, sclerosis and periosteal reaction with lipping similar to that seen in some malignant tumors.

Sequestra in syphilis are rare as compared to pyogenic osteomyelitis, because the infection progresses much more slowly and does not pro-

Fig. 5 (B)
Solid union following onlay bone graft.

duce death *en masse* of large portions of the cortex. Those that do occur are usually small and associated with gummata formation.

In cases of sinus formation with secondary infection, the appearance may be that of a chronic pyogenic osteomyelitis.

Diagnosis of Bone Syphilis.—While the diagnosis of bone syphilis is usually easy, in some of the atypical cases it may be extremely difficult. We should not rely on any single diagnostic agent to make the diagnosis, but should give due consideration to the clinical history and course of the disease, to the roentgenologic findings, and to the results of serological tests. Even after these have all been carefully considered, it is occasionally necessary to resort to the therapeutic test of antiluetic treatment or biopsy as a final answer to the question.

The most difficult lesions to differentiate from syphilis are the sclerosing osteomyelitis of Garré and some of the sclerosing types of osteogenic sarcoma.

Errors in diagnosis occasionally arise where systemic syphilis is present and gives positive serologic tests in combination with some other type of bone lesion. In such cases the effect of antiluetic treatment on the bone lesion may be the only distinguishing point.

The Reliability of Serological Tests in the Diagnosis of Bone Syphilis.—It is generally concluded in the standard texts on syphilis that the response to serological tests in adult acquired syphilis is quite variable, the percentage of positive tests as a rule diminishing with the age of the infection. This applies both to treated and untreated cases. Even with the appearance of tertiary lesions the serological tests are not always positive.

In view of these statements regarding the Wassermann reaction in systemic syphilis, it is interesting to note the relatively high percentage of positive tests in patients with acquired syphilis showing osseous lesions. Stokes, in reporting a series of 239 cases of acquired bone syphilis, gives 82 per cent positive Wassermanns and states that with the more sensitive tests in use today the percentage would be higher. In our own experience with over 100 cases of acquired bone syphilis, the Wassermann reaction has been strongly positive in over 90 per cent of the untreated cases. The Kahn test has been found to be equally reliable. Both tests have been performed together routinely and check almost without exception.

In cases where the clinical manifestations and serological tests are at variance, resort to the therapeutic test of antiluetic treatment has almost invariably proven the reliability of the serological test. Clinical experience has been so convincing in regard to the dependability of these tests that the diagnosis of bone syphilis in the presence of a negative Wassermann is made only in those cases that have previously received treatment or in those in which there is a positive clinical history, accompanied by typical roentgenologic changes.

In systemic syphilis of the acquired type, efficient antiluetic treatment usually effects a rapid decrease in the strength of the Wassermann test and negative Wassermanns are the rule before the termination of the routine courses of treatment. When bone lesions occur in the tertiary stage, however, fixed Wassermann reactions are more often encountered.

In congenitally syphilitic children over three months of age the percentage of positive Wassermanns is even higher than that of adults.

Influence of Trauma in Bone Syphilis.—It is difficult to estimate accurately the influence of trauma in the causation of any bone lesion. However, sufficient clinical data have been accumulated to indicate that in such conditions as acute pyogenic osteomyelitis, malignant bone tumors and syphilis, trauma plays a definite role in the localization of the osseous lesions and in the onset of clinical symptoms. Too many cases have been reported in which the bone lesion has appeared at the exact location of a recent definite trauma to be explained on the theory of mere coincidence. There is in all probability some lowering of the resistance by alteration of the physiology of the injured tissues which favors the onset of the disease. In our series of 150 cases of bone syphilis there was a definite history of trauma in 30 per cent.

It frequently devolves upon the medicolegal witness to express an opinion in regard to the relation of trauma in disabilities in which a positive Wassermann reaction is reported. A definite and well founded attitude on the part of the witness may do much in such cases to obtain a fair settlement for the patient and yet protect the company whom the physician represents from excessive damages.

Repeated minor injuries, unless they are definitely of an occupational character, should have little weight in determining the causation of the disability. On the other hand, a history of a definite trauma followed by the appearance of a

syphilitic bone lesion must be given due consideration as an etiological factor in the localization of the disease and in the production of disability. An attitude of this type will often obtain a more favorable response from a jury than an unequivocal denial that the injury played any part in the disability.

Relation of Syphilis to the Healing of Fractures.—It has long been assumed, both in the lay mind and among physicians, that syphilis exerts an unfavorable action on the healing of fractures, delaying or altering the formation of callus, thus contributing to the frequency of delayed union, malunion or nonunion. This opinion has had a deciding influence in many medicolegal cases. Neither clinical experience nor scientific facts offer any evidence to substantiate such an opinion. In fact, all of the evidence is directly to the contrary.

It is generally agreed by surgeons, whose combined experience covers the treatment of thousands of fractures occurring coincidently with systemic syphilis, that union occurs with the same promptness and regularity that is seen in the healing of fractures in the non-syphilitic patient. Our private fracture records at the Campbell Clinic and the experience gained in conducting the fracture services at the various hospitals in the city, are all in accord with this view. The fracture service at the Memphis General Hospital offers an abundant material for the study of this subject. There are approximately 500 fractures handled on this service annually. The vast majority of these patients are negroes. Statistics show that about 20 per cent of the colored patients admitted to the hospital have positive Wassermanns. No difference has been observed in the healing of these fractures as compared with our private practice, where the incidence of syphilis is about 2 per cent.

There is no evidence, then, to indicate that systemic syphilis delays or alters the healing of fractures; occasional exceptions to the rule are found in the extremely rare instances where, as the result of trauma coincident to a fracture, a syphilitic osteomyelitis may develop in the fractured bone or those adjacent to it. The fracture itself heals, but the disability is prolonged by the bone infection. It is most often seen in the small bones of the hands or feet. One such case is included in our records. We have frequently observed both traumatic and pathological fractures in bones which were already the site of a syphilitic osteomyelitis; union of the fracture occurred promptly in these cases just as it does in pathological fractures complicating pyogenic osteomyelitis.

These observations are in harmony with the known facts derived from a study of the pathology of bone syphilis. The pathological response of bone to syphilitic infection is essentially one of bone production. Even in those cases of destructive osteomyelitis and gummata formation there is always an active reproductive process accompanying the destructive changes.

The relation of syphilis to the healing of fractures has been approached from another angle by a study of a series of over 400 cases of nonunion of fractures of the shafts of the long bones treated or observed in the Campbell Clinic. The report of the routine Wassermann which was done on all these cases showed the test to be positive in only four instances, or 1 per cent of the series. The incidence of positive Wassermanns in cases admitted to the clinic for all causes is 2 per cent. These figures clearly indicate then that syphilis is certainly not more prevalent in our admissions for non-union of fractures than for any other disease. In only two cases of this group of 400 non-unions was it thought that the non-union was attributable to syphilis. These were in bones where, due to a syphilitic infection of long duration, a sclerosing type of osteitis had developed. The bone was of a hard eburnated type, the medullary canal was obliterated and the blood supply impaired by an alteration of the entire osseous vascular system. In these cases, both of which had previously received antiluetic treatment, it appears that the non-union was the result of the altered physical characteristics of the bony structure rather than to any active influence of the luetic infection.

DISCUSSION (*Abstract*)

Dr. Earl D. McBride, Oklahoma City, Okla.—It seems to me that since the essayist has raised the question of liability in cases where the alleged injury is proven to be complicated by syphilis, we should define more clearly how we are to testify as to the responsibility of the disease versus the injury in respect to liability for the disability. We all agree that syphilis is not caused by injury. We may disagree, however, as to whether the injury activated the syphilitic process at some localized point or not. In court decisions it has been held that the physiological lesion or damage sustained by the workman in the course of employment, if its origin is contributed to, in the slightest degree, by some ordinary effort of employment, constitutes an accident. It seems to me that the test of the case is to determine whether the disability resulting from an alleged injury was inevitable and probable, or only pre-

sumptive or illogical. For instance, a palmar abscess may occur from a trivial wound which may have been forgotten and the first attention may have been called to the abscess several days after the wound healed. In such a case the abscess was the direct result of the original injury.

Where syphilis complicates an injury we must recognize that the disease is of a systemic nature. It not only existed before the injury, but it was a potential contributor to disability at any time that it might be given a stimulus to local activity. We should distinguish, therefore, how long and how great the disability would have been without the presence of disease and if the disease eventually would have produced the disability had the injury not occurred. Furthermore, we must decide whether the injury was a mere incident occurring in a region already involved in a disease process and whether the localized pathological process was not present at all until the injury occurred.

When such questions can be answered the responsibility of the injury for the disease can very well be explained.

Dr. R. B. Davis, Greensboro, N. C.—This brings to our mind the great value of a pre-employment and a yearly physical examination for all railroad employes. I wish to make a plea that all railroad surgeons use their influence in getting the authorities of the railroad to establish a routine medical examination.

In many fracture cases it is not enough for us to be convinced that syphilis may be delaying the return of the employe to work. We must be able to convince the jury of twelve non-medical men. If the injured person had a positive blood Wassermann before the accident they know what that means.

Dr. Don C. Eskew, Miami, Fla.—There are different laws of compensation in the various states: Michigan has one type of law, Ohio quite a different one. Therefore, we must accommodate ourselves to the individual law of our own state.

As a rule the employe does not wish to persecute his employer; his desire is to return to work following an injury. His wish is to obtain that dollar that means his daily bread.

Extra medical care may be necessary to return the injured man to work and he is then satisfied. It is usually far cheaper than the price of litigation. One must remember that any one may sue, regardless of his right of action. It is the duty of the court to decide whether he has a right of action or not. I believe it is cheaper to get the man back to work.

If antiluetic treatment is thought necessary because of slow or delayed healing, or the patient does not seem to be recovering fast enough, give arseno-benzol. It will be far cheaper in the end.

Dr. Geo. A. Traylor, Augusta, Ga.—Dr. Carothers has called our attention to a very important matter, medical testimony; and, while it may have little direct bearing on the paper just presented, I feel that it has particular significance for railway surgeons. The school with which I am associated, the Medical Department of the University of Georgia, has a lectureship on this subject, and it is conducted by one who has had a large experience in this field.

Dr. Speed (closing).—The purpose of bringing this paper before the Section on Railway Surgery was not to go into a detailed discussion of the pathology of bone syphilis, but to point out some of its more common manifestations in order that the profession as a whole might become more familiar with them.

We should always consider the possibility of syphilis in dealing with bone lesions of any type, particularly those which may present unusual or atypical characteristics.

It has long been recognized that trauma has a definite influence on the development of lesions in bone. This has been clearly demonstrated in acute pyogenic osteomyelitis and in bone tumors and should be recognized as a possibility in syphilitic bone lesions.

I wish to emphasize again the important fact that syphilis, *per se*, has little or no effect upon the healing of fractures. As a general rule the fractures heal with the same regularity in the presence of active systemic syphilis as they do in normal cases. It is only in those cases where a hardening or sclerosis of the bone has resulted from previous syphilitic lesions that non-unions are liable to occur. It is felt that the presentation of clinical facts and statistical evidence to support this fact will materially aid surgeons in treating the fracture itself and in forming their attitude in medicolegal testimony.

ECTROPION*

A PROBLEM FOR EYE SURGEONS

By JOHN M. WHEELER, M.D.
New York, New York

There is a mild conflict of ideas regarding repair surgery about the eyes. Men who are devoting themselves to plastic surgery find much of their work about the face, and some of them see no reason for stopping at the eye region. Perhaps it is not for the ophthalmologist to pass judgment on whether the plastic surgeon is right or wrong in including the eye region in his realm, but surely the ophthalmic surgeon should enter into vigorous competition with the plastic surgeon and claim the eye region as his own. I am convinced that patients needing plastic repair about the eyes would be well served surgically if eye surgeons would devote themselves the acquisition of skill in plastic procedures as they do to the study of surgery of the eyeball. I should like to take this occasion to bespeak the interest of our younger eye surgeons in the maneuvers that make up eye plastic surgery. Let me suggest to those who are setting out to qualify as ophthalmologists that they consider the acquisition of skill in plastic procedures as part of proper preparation for the practice of ophthalmology if they propose to include sur-

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*From the Institute of Ophthalmology, Columbia University.

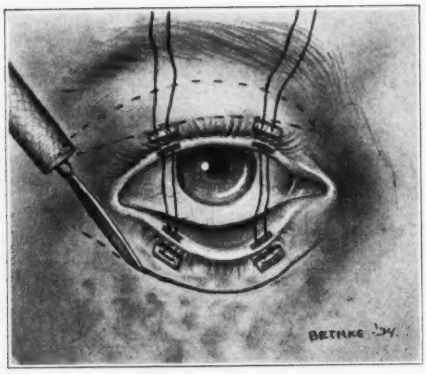

Fig. 1

Cicatricial ectropion of right lower eyelid. Dotted lines on upper lid indicate outline of skin graft. Primary incision following course of everted lower lid margin. Four rectangles of epithelium have been removed from lid margins and silk sutures have been carried through these areas.

gery in their practice. A great variety of interesting and difficult problems offers a fascinating challenge to the ingenuity and skill of the surgeon. I should like to see the trained ophthalmologist ready to liberate the necessary ingenuity and skill.

What does one reasonably mean by the surgical eye region? I think the answer can be stated. It includes the contents of the orbit, the eyelids, the eyebrows and the adjacent surroundings when they harbor processes that affect these structures. If a scar extends from an eyelid beyond the orbital margin into the malar region or into the brow or cheek it might be absurd for the eye surgeon to fail to get rid of such a scar in correcting a lid deformity. A reasonable attitude should guide the eye surgeon in deciding where to stop.

Gasparo Tagliacozzi (1546-1599) said:

"In order to live a graft must have an attachment. It cannot be completely severed from surrounding tissues. It must have a pedicle."

This dictum has had a profound influence on plastic surgeons. It was taken as gospel until Jacques Louis Reverdin, a young Swiss doctor who was serving as interne at l'hopital Necker in Paris, demonstrated in 1869 that it was possible for the surgeon to transplant bits of epidermis to a granulating surface and have these little grafts live. In spite of his demonstration and the additional demonstrations of Ollier, Thiersch, Wolfe and many others, able surgeons still are dominated by the idea of necessity of pedicles for grafts. So, in the correction of ectropion many competent men still choose to use pedunculated flaps. In doing so, they accept a serious handicap and I should like to say that there are very few cases of ectropion that call for flaps with pedicles. After making the necessary incisions and dissections to carry the eyelids into proper position for the correction of cicatricial ectropion, a characteristically shaped denuded area results. This denuded area represents the bed that is to receive the graft and it is almost always nearly crescentic in shape (*Fig. 2*). A flap to fit this bed should have a similar shape with pointed ends. There can be a little variation in graft outline. For example, a fusiform flap will adapt itself to a crescentic shaped bed, but there should be a strong similarity in form of bed and graft. Manifestly, a graft with a pedicle never fits accurately after the dissection for cicatricial ectropion has been made. With the use of proper technic there need be no fear of loss of a skin graft without a pedicle. The fact is that loss of the tip of a pedunculated graft through passive congestion is a common thing, but the tip ends of a free graft take with the same exactitude as any part of the graft. The use of accurate fitting, non-pedunculated skin grafts is in line with simplification of plastic surgery procedures. Ectropion can be corrected by simple technic.

True skin of the eyelids is the best material to make up localized shortage of skin in the eyelids, as in ectropion. So, whenever it is feasible for the surgeon to choose his graft, his

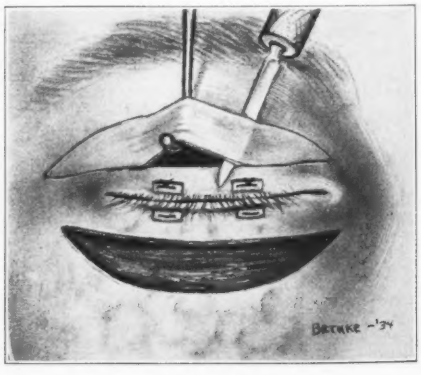

Fig. 2

Sutures have been tied to bring denuded areas on lid margins into firm apposition, so that two inter-marginal adhesions will form. The graft is being removed from the upper eyelid to be placed on the prepared bed of lower lid.

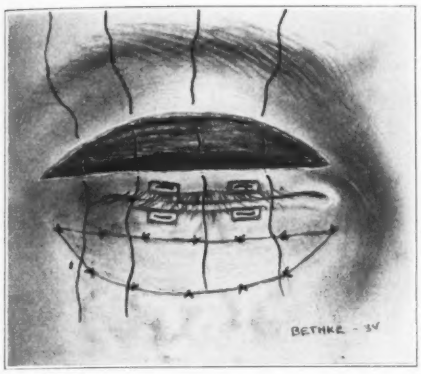

Fig. 3
The graft from the upper lid has been sutured in position in the lower lid. Sutures have been placed to close wound in upper lid. No undermining is necessary.

first choice is a detached flap from the upper eyelid. In adults normally there is skin to spare here, and even in babies the upper lid will yield a narrow graft of skin. True skin from the arm has been used many times, but it does not match real well as to color or texture. There is too little pigment in it and there is too much connective tissue. A narrow fusiform piece of true skin from the temple makes a rather good graft for the eyelids, if it has been split or if it has been thinned with the flat of scissors. However, a graft from behind the ear is almost thin enough and of almost good texture. It is easily taken and a fusiform graft, say an inch wide, can be taken from almost any adult without giving deformity (sometimes, indeed, with acceptable improvement in appearance, as the auricle may be made to lie closer to the head if much skin is removed). No undermining of skin is necessary usually after the graft has been taken from the cephalo-auricular angle. The denuded area with its angular concavity is obliterated merely by suturing together the wound edges. For the severe cases of ectropion which require large grafts there is always an abundant supply of epidermis (epithelium). The best place from which to get large pieces of skin epithelium is the outer aspect of the thigh, from the skin overlying the thick fascia lata. This tissue never gives a perfect match, but it is useful if one has no choice, and it may match fairly well if the patient has large areas of scar tissue, covered with new-formed epithelium, as may be the case following burns of the face. If asked to name different sources of skin for surface grafting about the lids, I should choose in this order: (a) dermis from upper eyelid, (b) dermis from cephalo-auricular angle, (c) dermis from temple, (d) epidermis from the outer aspect of the thigh.

If the surgeon has to use more than one graft, as he might in marked cicatricial ectropion of the lower lid, it may be well for him to transfer a graft from an upper lid to a lower lid near the palpebral fissure, and one from the cephalo-auricular angle to a place farther from the fissure where the skin normally has more connective tissue and so is thicker and less pliable. So, in the case of contracture in and below the lower lid, a graft from an upper lid might be planted near the lid margin and a graft from the cephalo-auricular angle might be planted just under it.

Let us suppose we have a case of simple cicatricial ectropion involving a lower lid (*Fig. 1*). An incision is made through the skin 4 or 5 mm. from the lid margin. This incision may start below the inner canthus and follow the entire length of the lid margin. If the outer canthus is depressed by the scar tissue process, the incision should be carried beyond the outer can-

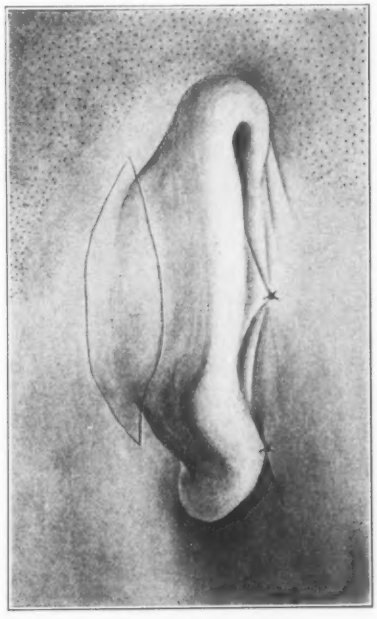

Fig. 4
Fusiform cephalo-auricular angle graft of true skin is outlined. Margin of auricle is tacked to the skin in front of tragus.

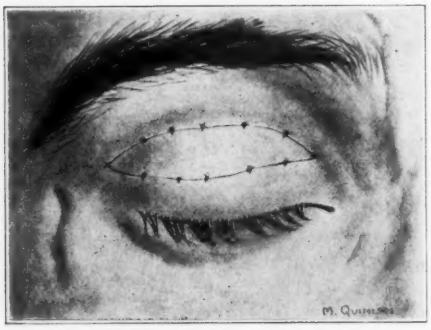

Fig. 5
Graft of skin from cephalo-auricular angle is placed in upper lid for correction of cicatricial ectropion.

thus into the malar region. The scar tissue underlying the skin is carefully dissected away and the lower lid should be so thoroughly released that the lid margin will come easily into position in apposition with the upper lid margin and it should lie relaxed against the eyeball. If the outer canthus is to be elevated, any scar tissue holding it at too low a level should be dissected away and the external canthal ligament should be sutured to the periosteum at the right level.

Usually two inter-marginal adhesions should be made. Ordinarily these should be placed so that they will straddle the cornea and allow the patient, after operation, to look through the palpebral fissure, which is slightly opened between the adhesions. If there is a definite linear scar, so deep that it is impossible for the surgeon to remove it entirely, then an adhesion should be placed in line with this scar. After operation the upper lid will give good support to the lower lid, and attempts on the part of the patient to open the eye result in stretching of the graft. To make these adhesions the surgeon removes rectangular strips of epithelium from corresponding places in the lid margins. Ordinarily these strips would be almost as wide as the lid margins and about 5 mm. long. The raw surface of the denuded areas can be increased by incisions into them so that the little flaps will spread when the lid margins are brought together. Double armed sutures, mounted with plaques of rubber from tubing, are carried through the skin of the lower lid about 2 or 3 mm. from the lid margin. The sutures are brought through the denuded areas of the lower lid margin and through corresponding areas in the upper lid margin and carried through the skin of the upper lid about 3 mm. from the lid margin. These sutures are tied over small plaques of rubber and the denuded areas in the lid margins are brought strongly into contact with each other and held in close apposition by the sutures until the first dressing five days after operation.

A graft of epidermis and true skin is then dissected from the corresponding or opposite upper lid and sewed in place over the denuded area in the lower lid. The graft should be only slightly larger than the area to be covered and it is sewed in place with fine silk or hair sutures. (The surgeon can obtain sterilized, ready to use, fine silk sutures mounted on very fine needles, without doubling of the threads and without knots, "atraumatic".) The wound in the upper eyelid is closed with the introduction of a few fine silk sutures. No undermining is necessary, as the wound will not open up. In taking the graft it should not be picked up with forceps. A knife is carried under the graft and it is then lifted with a hook and supported while the section is completed (*Fig. 2*). After the graft has been removed it is placed, raw surface upward, on a gauze pad, damp with body temperature normal saline solution, and any bits of muscle tissue are removed with scissors. Sutures can be carried through the tips of the graft while it is resting on the warm pad and at no time should the graft be pinched with forceps. The sutures are carried through the graft just as near the edge as possible. They should be carried through the skin surface surrounding the bed almost exactly at the wound edge. Sutures properly applied will not leave visible scars.

The graft is covered by a smooth, unperforated tissue. Gutta percha or some substitute is acceptable and it is well to put on two layers with the grains crossed. A very little vaseline is smeared over the surface of this tissue. Over that is packed sterile gauze. The gutta percha tissue should overlap the graft only a few millimeters and the gauze dressing should overlap the tissue only slightly. Over the compact dressing, strips of adhesive plaster are placed so as to make as much pressure as they will give. The strips should be placed obliquely so that they will not go near the mouth. The surgeon then applies a pressure bandage and over that he puts long strips of adhesive as tightly as possible. This makes a firm pressure dressing which will immobilize the lids. The pressure will prevent the collection of blood under the graft and

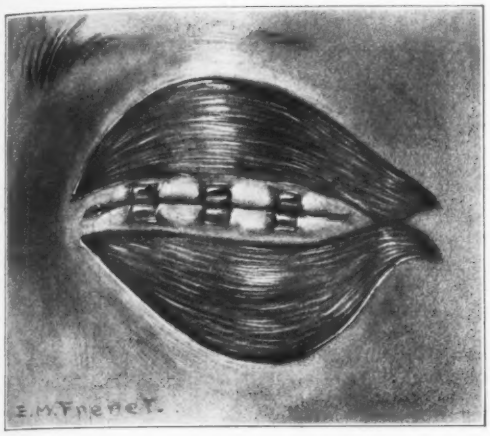

Fig. 6
Case of severe ectropion. Dissection completed and preparation made for three inter-marginal adhesions.

it will make firm apposition between the raw surfaces of graft and bed and so make complete, sustained contact possible. The most important thing gained by pressure is the inhibition of granulation tissue formation during the healing process. A minimum of granulation tissue means a minimum of secondary contraction of the tissue underlying the graft.

The first postoperative dressing should be done in five days. The removal of the dressing should be accomplished with great care and the patient should not be allowed to squeeze or hold his breath. He should be relaxed. Otherwise the graft might be disturbed by hemorrhage under it. The inter-marginal sutures should be removed at the first dressing and the patient should be cautioned to keep both eyes closed until the dressing is reapplied. If he is allowed to attempt to open the eyes the inter-marginal adhesions may be either broken or weakened. The pressure dressing should be re-applied. It can be changed every three days, but the protective tissue over the graft and the snug dressing ought to be continued for a period of two weeks. The outer layers of epidermis loosen and leave the graft, but new epithelium should cover it thoroughly by the end of two weeks. Any of the fine sutures in the upper or lower lids that have not fallen out should be removed toward the latter end of the two weeks period. After the dressing has been discontinued the graft should be gently anointed with vaseline about twice a day and it should not be allowed to become dry for several weeks. The adhesions should be left in place until all tendency toward ectropion has disappeared.

A test for correction can be made by having the patient look extremely up while the surgeon prevents elevation of the upper lid by holding it down with his finger. If under these conditions the lower lid shows no tendency to leave the globe and the punctum stays accurately in place against the globe, correction can be considered complete, and the inter-marginal adhesions can be cut.

After a period of months, adhesions are destroyed by simple incision with the scissors and no anesthesia is needed if the incisions are made quickly. Usually the scissor incisions should be near the level of the upper lid margin, and little protrusions be left on the lower lid margin at the sites of the adhesions. These do not have to be excised, as they will gradually disappear and the epithelium will evenly cover the lid margins where the adhesions have been.

Cicatricial ectropion of the lower lid can be fully corrected by this method. The eyelid should be very nearly perfect functionally and cosmetically. The lower lid margin ought to be at the right level and firmly in contact with the globe. The tear conduction ought to be good, and the graft should match so well that its margins cannot be seen, and it will have good color, texture and pliability. The removal of a skin graft from an upper eyelid may make the lid slightly too short vertically for a time, but

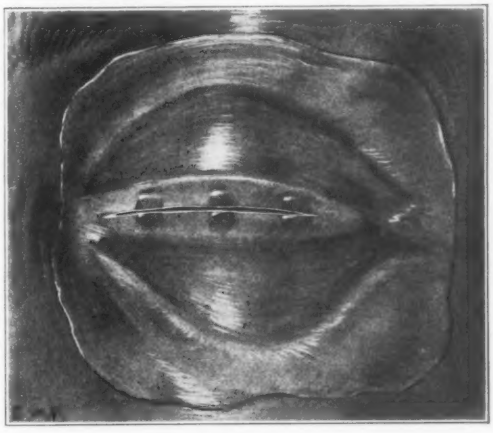

Fig. 7
Single epidermal graft from outer aspect of thigh placed over denuded areas. Slit in graft in front of palpebral fissure. Graft overlaps skin surrounding the dissection.

the skin will stretch and ultimately there will be no impairment or deformity because of the removal of skin.

Ectropion of the upper lid is less common than that of the lower lid and its correction is relatively easy. A graft from the fellow upper lid furnishes the best tissue. Usually it is not necessary for the surgeon to introduce inter-marginal adhesions in correcting ectropion of the upper lid, but in inter-marginal sutures should be introduced before the pressure dressing is applied so that injury to the cornea cannot result from the pressure dressing. If the lid margins are in firm contact with each other any amount of pressure can be applied without damage to the cornea. In case the upper lids will not furnish adequate skin for grafting, a cephalo-auricular angle graft (*Fig. 4*) or a fusiform temple graft can be used. In the case of removal of skin from the temple, free undermining has to be done before suturing to close the wound, or else the wound will open up. No undermining for closure of the cephalo-auricular angle exposure is necessary when the graft is taken from behind the ear.

The surgeon who is trained in the use of detached grafts such as described and who is accustomed to the beautiful results that they afford, would not use pedunculated grafts by preference.

In cases of very severe ectropion with considerable scarring of the face, it may not be feasible for the surgeon to depend upon the skin from neighboring regions. In such cases the skin epidermis from the outer aspect of the thigh may be used for correction of both upper and lower lids at one operation. The dissection in such a case may result in an exposure like that shown in *Fig. 6*. A razor graft of epidermis is taken from the outer aspect of the thigh and placed over the denuded areas with generous overlapping of the surrounding skin. *Fig. 7* shows an epidermal graft from the thigh in place. A horizontal slit in the graft has been made in front of the palpebral fissure so that excessive conjunctival secretion will pass through the graft. No sutures are used to hold the grafted epidermis in place, but reliance is put on the pressure dressing which is placed over the protective tissue lying on the graft. The portions of the epithelial flap that overlap skin die, but the epidermis in contact with denuded areas lives. Contraction of the skin about the lids may go on for a long period in very bad burn cases and secondary grafting operations may be necessary. Early operation in bad cases of ectropion is called for on account of the danger to the cornea from exposure. While the functional and cosmetic results cannot be as favorable with epidermal grafts as with true skin grafts, as described above, in some cases the matching of graft and cicatrised skin is surprisingly good. Epidermis should be used only when the surgeon has no reasonable choice.

635 West 165th Street

SOME SINUS CONDITIONS WITH UNIQUE SYMPTOMS*

By T. W. Moore, M.D.
Huntington, West Virginia

The past few years have seen many changes in our views on nasal sinus disease, in symptomatology, in treatment and particularly in sinus disease as an etiological factor in general and remote pathologic conditions.

Today we look upon postnasal discharge as the most constant symptom. This is emphasized in a recent summary[1] of sinus symptomatology which I quote because it presents a systematic study of this phase of the subject in one of our large clinics:

"By far the most common symptom of sinus disease is a postnasal discharge. This was the chief symptom in eighty cases. Other symptoms in order of their frequency were nasal discharge, recurring head colds, nasal obstruction, ear complaints, cough with and without the production of sputum, asthma, and allergy. In this group of patients, twenty complained only of cough or bronchitis. Very often a patient comes to us after a diagnosis of frontal sinusitis has been made because of pain over the frontal region. Of twenty-five cases of acute maxillary sinusitis, pain was present over the affected cheek in nine instances and over the eye in four. In one case, the pain was referred over the opposite antrum, which was quite clear on transillumination."

Our ideas on treatment have become less radical, for we find that many cases may now be made free from all symptoms by simple continued washings through their natural openings, or the middle meatus. This applies particularly to the maxillaries. By those skilled in this procedure the washing may be done with a minimum of trauma or discomfort to the patient. Many cases may be helped very much by attention to the diet and hygienic conditions.

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*Read in Section on Ophthalmology and Otolaryngology, Southern Medical Association, Twenty-Ninth Annual Meeting, St. Louis, Missouri, November 19-22, 1935.

The most pronounced changes, however, are in our views as to sinus disease as an etiological factor in disease in other parts of our anatomy. One school of which Trevor Owen[2] is a most graceful representative, claims that sinus disease enters into causative relationship with other ailments so infrequently as to be negligible. Most of us are not prepared to accept this very radical pronouncement, but we have drifted away from the extreme view of many men of prominence who stated with the greatest conviction and convincing arguments that sinus infection is a proven factor in disease in almost any organ in the body, as in the lungs, kidneys, joints, heart, liver and so on *ad infinitum*. The truth probably lies somewhere between these extremes.

It is not my province today to enter into this discussion, but to describe to you a very few cases that have manifested unique symptoms that have been attributed to sinus disease, all of which have been relieved by treatment of the sinus condition.

Many patients suffering with badly infected sinuses seem to be unconscious of their ailment. I remember a nurse working in our office who had at all times a very offensive breath. Some one noticed that when she blew her nose her handkerchief was covered with purulent secretion. Examination showed that her antra were filled with foul-smelling pus, which subsided after treatment, as did the associated fetor of her breath. She denied ever having headaches or colds or any constitutional symptoms. The only thing that we noticed was a chronic inertia. She left our employ before time enough had elapsed to determine whether this characteristic had subsided.

To demonstrate some of the freak forms which infection from sinusitis may take, I wish to report the following from my practice:

Case 1.—On May 22, 1935, B. M., aged 16, was sent to us from the Kentucky coal fields on account of blindness of two months' duration, which was attributed to a slight injury that occurred just prior to the onset of the blindness.

His family history was negative. The parents were living and well. The mother suffered with hay fever. He was one of eight children, three of whom were dead, one at five years of age from pneumonia, one at one year and one at three years. The cause of the death of the last two he did not know.

He had had influenza several times, but it lasted only a few days at a time. There was no other illness.

He was struck over the right eye, producing a wound that had to be "clamped," when he was 6 years old. His left foot was run over by a wagon when he was 5 years old. He said that the arch of this foot was weakened. He had had no operations.

He was struck by a 2x4 timber across the forehead the last of February of this year, was not knocked down nor unconscious. The only symptom was that the flesh was bruised for a few days.

On March 12 a fuse wire ignited, burning his hair and one eyebrow. The patient did not think that he was injured by this.

On March 15 he became practically blind; as he explained, he thought a curtain fell over his eyes, causing greatly impaired vision, since which time vision had been gradually growing worse.

Physical examination revealed a boy five feet eleven inches tall, weighing 152 pounds. The pupils reacted sluggishly. The eyeballs were absolutely immobile, that is, he was unable to use any of the extra-ocular muscles.

The vision of the right eye was fingers at two feet; left eye, fingers at eighteen inches. Retinoscope showed +0.75 sphere, each eye, but this did not improve his vision. Examination of the ocular media and fundi, as far as we could determine, showed them to be normal.

General physical examination was essentially negative. Transillumination showed all the sinuses to be normal except the right maxillary antrum.

X-ray confirmed the above. Wassermann and blood count were negative.

The only discernible pathologic condition was right maxillary sinusitis with questionable left maxillary sinusitis.

Both maxillaries were irrigated through the natural openings. The right contained about two drams of muco-sanguinous pus. The left antrum was negative. We also irrigated the right sphenoid, which was also negative. This, the patient stated, produced pain in the eyeballs.

Almost immediately after this washing of the sinuses the patient said that he could move his eyeballs a little and he thought that he noted improvement in his vision. Three days later a test showed vision to be 20/20 in each eye, his fields of vision were normal, and he had perfect control of the extra-ocular muscles. We kept him under observation for one week, washing his antrum daily. It was then free from pus.

This patient had been handled by very competent physicians and also one ophthalmologist, who examined only the eyes, and who stated that he was unable to find any cause for the fixed position of the eyeballs or the lack of vision.

He was referred to us for an estimate of damage in order that compensation might be adjusted for impairment of vision.

A letter from his physician August 9, 1935, said: "I examined B. M. today. He seemed to be perfectly normal in every way; says he has been working and has had no further trouble with his eyesight. However, he complains of occasional frontal headaches. I believe the boy will have no further trouble."

Case 2.—Another case is that of a 10-year-old boy who was brought to us in 1925, having suffered with an aching tooth for two or three days with absolutely no history that could be interpreted as sinusitis prior to this sudden onset. We found his right cheek much

swollen, with pain and tenderness over the maxillary antrum and lachrimal bone, but no evidence of an affected or decayed tooth. The next day the swelling had increased very much, involving the whole side of his face. We decided to open the antrum, which we found filled with foul-smelling pus, and also that the roof of the antrum had eroded into the orbit. His condition did not improve, and as he had developed a choked disc on that side, five days later we opened a retrobulbar abscess through the ethmoid, entering externally. We found the periosteum separated from the bone across the roof of the orbit. We put in a gauze drain, leaving the wound open. The following day the boy's condition was much improved and his father took him from the hospital to their home in the country in spite of my strongest protest.

I did not see this patient again until September 27 of this year (ten years after his operation) when his father came into my office with him. He now has atrophy of the optic nerve and a restricted movement of the superior oblique muscle of this side. This produces noticeable strabismus in very few positions of the eyes. The father stated that the boy was much improved when they reached home the evening after leaving the hospital and that he has had no medical attention for anything since I saw him over ten years ago. There is no evidence in the nose of sinusitis.

It is very interesting that a boy who had had no symptoms of infection should develop a virulent acute condition, and also that his recovery should be complete with no after treatment later than twenty-four hours after breaking down and drainage of the ethmoids. I wonder whether we sometimes over-treat our postoperative cases.

Case 3.—Some years ago I[3] reported the removal from the orbit of a bullet that had entered under the chin, penetrating the sublingual tissues, the tongue, maxillary antrum and lodging in the orbit, producing an exophthalmos. The x-ray picture showed the bullet plainly in the orbit behind the eyeball. I opened the antrum as for a Caldwell-Luc operation. This was filled with stinking pus, the wound having occurred fifteen days previously. I had considerable trouble in locating the bullet, as the soft tissues had swollen about the wound, but finally succeeded in grasping it with forceps firmly enough to remove it. This patient recovered rapidly, my greatest difficulty being in having the eyeball recede. This was, however, accomplished by a pressure bandage without any ultimate impairment of vision, although the patient was blind in this eye for six hours immediately following the injury. A report from this patient two weeks after he left the hospital said that he was all right except for a sore tongue.

This case contrasts strikingly with the one just preceding, where a rapid development of infection of the orbit took place. Here no infection developed, although there was an opening from an infected antrum into the orbital tissues for over two weeks.

Case 4.—A patient whom we had treated for attacks of sneezing in 1927, which had persisted for almost a year, had been relieved by a submucous resection of the nasal septum. In 1931 his tonsils were removed. In 1934 he presented himself on account of a throbbing pain in the left side of his throat so severe that he could not sleep except when given a narcotic. This pain was not affected by swallowing. The most careful examination failed to reveal any abnormality in the throat. The teeth were normal. No special seat of tenderness could be located in the neck or throat. We could find no evidence of sinusitis by inspection of the nose or pharynx. However, the placing of a swab of cotton saturated with cocaine solution over the spheno-palatine ganglion gave complete relief as long as the anesthesia lasted. X-ray showed no sinus disease except in the left sphenoid, which was slightly cloudy. Irrigation brought out about one-half dram of pus. Irrigation was repeated every three or four days for about three weeks, when the washings were negative. After the fourth irrigation the pain ceased entirely and has not returned. This pain, which I at the time regarded as a glosso-pharyngeal neuralgia, did not meet Sluder's[4] specifications of this type of neuralgia, as it was not excited by eating or talking nor was it paroxysmal in character.

Case 5.—September 22, 1929, a woman aged 33 was brought to me complaining of intense pain in the occiput and back of the neck. She was exceedingly nervous, with attacks of jerking of the head and upper extremities, and nausea and vomiting for the previous week. Her family history was negative.

She had had generally very good health with no complications from mild diseases of childhood. She had diphtheria without sequelae at 11, a light attack of influenza one year previous to our examination, and some headache with drawing back of the head in the previous year or so. Her teeth were fairly good and her appetite was good until operation, July 31. She had had some belching and much gas, usually in the evening, that lasted sometimes for several days. She rarely vomited, but had sour stomach. The bowels moved daily without a laxative. She had much trouble with bleeding piles. Menstruation began at twelve years, the cycle was four weeks, lasting four or five days, sometimes with cramping before flow. Labors had been normal. She had had one miscarriage one year before at two and one-half months. She had had no urinary disturbance.

Laboratory examinations of blood and urine were negative.

On July 31, 1929, she was subjected to the following operation: low median celiotomy, complete abdominal hysterectomy, right salpingo-oophorectomy, excision of adenofibroma of the rectovaginal septum, appendectomy and closure.

On August 28 she was readmitted to the hospital where the operation had been performed July 31. She said that she had done well since she left the hospital and gained five pounds. She felt a general headache a few days before her discharge which continued almost constantly, two or three hours in one part of the head, then in another region. The scalp was very sore, especially above and back of the ears, and the back of the neck was sore. She had been up only to meals and to sit in a chair a little.

A radiograph taken of the sinuses at this time was interpreted by the general surgeon as showing clouding of both maxillary sinuses and discharge of pus from the ethmoids. He said that local treatment with ephe-

drin helped to clear up the sinus condition and she showed some improvement.

Lumbar puncture was done, the spinal fluid pressure being normal. On examination the fluid was shown to be entirely negative, with a negative Wassermann.

The patient and her friends were quite insistent that all of her symptoms dated from the use of spinal anesthesia at the time of her abdominal operation and were unable to recall her having had headaches prior to that time, although the history taken when she was admitted to the hospital in July shows that she had had headaches and some retraction of the head for several years.

My examination showed pupils normal in size and equal, the right reacted more sluggishly than the left, and after dilatation with euphthalmine and cocaine the right pupil failed to contract to normal, remaining larger than the left. Maxillaries and frontals were clear to transillumination.

At times the patient was able to obtain, by clearing the throat, a small amount of purulent secretion. X-ray showed the maxillaries and frontals negative, but cloudy sphenoid sinuses.

The temperature was normal at the time of admission, pulse 80, respiratory rate 22.

Her vomiting ceased after she discontinued morphine, which she had been having in sufficient quantity to control her pain.

During the night of September 23 her temperature went to 103°, pulse to 120 and became irregular. September 24 I drained the sphenoidal sinuses. It was necessary first to do a submucous resection and remove part of both middle turbinates, after which I entered the sphenoid sinuses. The right sinus was very large and filled with foul-smelling cheesy secretion. I enlarged the opening downward to the floor of the sinus and toward the temple. I also opened the left sinus, which contained a small amount of fluid. I washed out the right sphenoid sinus every day after the second day, and for almost two weeks the washings had a foul odor. The patient's headache ceased immediately after the operation. Her nervousness gradually subsided, but was not entirely gone for almost one month. The right pupil did not return to the same size as the left for about ten days.

The last of October she returned to her home and resumed her duties as a farmer's wife, apparently entirely recovered, which was verified by a postal written to me later.

May 3, 1932, this patient returned complaining of dull headaches which were relieved by fitting proper lenses for constant wear.

In September of this year I again examined her, found the right sphenoid sinus patulous and that she rarely has a slight headache.

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DISCUSSION (*Abstract*)

Dr. H. S. Hedges, Charlottesville, Va.—In reviewing Dr. Moore's cases we must all be impressed with the difficulty of determining which subjective symptoms are explained by sinus disease, or the indirect and distant effects of a given visible or invisible pathologic condition.

Many patients fairly reeking with pus have practically no discomfort except the annoyance of clearing away the ever-present discharge, no signs of absorption, nothing; others, in whom it is difficult to demonstrate any abnormality, suffer severe pain or show undoubted evidence of toxic absorption.

As a rule, I believe that pain, often the patient's and doctor's best friend, is rarely absent in infections of the frontal sinus, so that we do not often find a really silent frontal.

The ethmoids, also, usually make themselves plainly heard from if they harbor trouble; and the sphenoids, if undergoing marked pathological changes, will nearly always make their trouble known by deep-seated headache or severe neuralgias whose source may be difficult to locate, but which painstaking search will nearly always run down to its den in the body of this bone, which has many points of contact with the rest of the skull, and whose cavities vary greatly in size and shape and extent. (In our work, however, we see relatively few sphenoid involvements.)

There is another offender which, though the easiest of all to approach and treat, is often strangely overlooked. No one is going to miss an acute maxillary antrum, though the pain is often referred to the temples, or an annoying cough may be the only symptom. But there are many silent antra that cause no local pain, show practically nothing on intranasal examination, transillumination or x-ray, which may be the cause of severe general neuritis and arthritic troubles, a most annoying cough, in short any or many of that long train of troubles whose cause we look for in toxic absorption.

A friend in this audience today was a martyr for years to spondylitis. For three and a half years he wore a heavy spinal brace. No cause could be found. He was x-rayed, transilluminated, apparently studied in every way possible. One happy day Dr. Woodward got hold of him and washed his maxillary sinuses. Both were full of stinking pus and the brace is gone and the back getting supple again.

A patient with annoying toxic labyrinthitis was referred to our clinic to have the sinuses examined as possible cause. Direct inspection, transillumination and x-ray were all negative. Getting tired of us, he went to Washington hospitals with the same result. They referred him to Cushing, who sent him back to them, advising them to restudy the x-ray plates. They did so, concluded there might be trouble in one antrum, washed it, found it full of pus and the labyrinth promptly cleared up.

So I want to make one plea, foolish as it must seem before such a body as this: when asked to examine the nasal sinuses as possible sources of trouble, never consider the search complete until the maxillary antra are carefully washed.

I urge this strongly since a large proportion of these

cases can be entered by the natural opening with a minimum of pain and trauma.

Dr. E. H. Ford, Knoxville, Tenn.—In cases where it is difficult to make a diagnosis we should not depend too much on the x-ray. Frequently we have a hyperemia or congested sinus and the x-ray plate will show a negative when we may have a positive sinusitis. Therefore, we should use all methods at our disposal before we say that the patient has or has not sinusitis.

Dr. Millard F. Arbuckle, St. Louis, Mo.—Disease in the field of rhinology presents many complex problems which at times are the more complex because of their "borderline relationship," that is to say, with symptoms in common and difficult of differentiation from disease in neighboring fields, such for example as the brain. Particularly is this true with those lesions accompanied by acute exacerbation of pain followed by cessation without adequate explanation therefor, or paralysis or spasmodic contraction of individual muscles of a temporary fleeting nature. Sudden and unexplained cessation in some cases of pain associated with corneal ulcer after operative interference designed to relieve a suppurative focus in one of the paranasal sinuses is not always readily explained.

The application of our knowledge of allergy has fairly revolutionized the practice of rhinology, particularly with regard to lesions just mentioned.

As Dr. Moore has pointed out in his case reports, infectious sinusitis, if not ventilated and drained, will produce fever, rapid pulse, vomiting and other signs of sepsis, while on the other hand many individuals are subject to widespread infection of the sinuses, but because of free drainage are remarkably free of symptoms.

Dr. Moore's frequent reference in his case reports to the Wassermann and other laboratory findings, including spinal puncture, as well as other special examinations such as refraction, make us realize that he constantly has in mind the possible relation of disorders such as brain tumor, meningitis, syphilis, tuberculosis, sepsis, impacted molars, and so on, to the cause of symptoms often erroneously charged to sinus disease.

As shown by Dr. Moore, it is important to remember that a single sinus, for example, the sphenoid, may be diseased and give rise to serious disorder while all the other sinuses may be practically normal. I recall the case of a middle-aged woman, whom I saw in consultation with an internist a few years ago, whose disease resembled typhoid fever. After considerable delay it was discovered that her left sphenoidal sinus was the site of an empyema. Surgical drainage was followed by prompt recovery.

It will be gathered from a consideration of Dr. Moore's remarks as well as those of other speakers here and elsewhere that the treatment of sinus disease has undergone considerable change within the past ten or twelve years, the pendulum having swung away from surgery. This of course is due to our increasing knowledge of the causes of sinus disease and the realization that sinus disease may be infectious or allergic in nature or a combination of these two. It is generally recognized and accepted that the treatment of allergic disorder of the nasal sinuses is medical, also the treatment of infectious sinusitis in a great majority of cases is medical, but in a moderate number in which infection is present with constitutional or local signs and symptoms sufficient to indicate it, surgical intervention is necessary.

There are those who have gone to the extreme in saying that no sinus case requires surgical intervention, particularly if an allergic disorder be present. Experience seems to indicate that free drainage in the presence of pus is indicated whenever or wherever found, be the individual allergic or not.

SOME BIOCHEMICAL FACTORS OF HEART FAILURE*

By GEORGE HERRMANN, M.D.
and by invitation
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In the ultimate analysis all functional failure is dependent upon derangement of the metabolism of individual cells. The term "heart failure" connotes that the heart muscle mass is no longer able to do the work necessary to maintain the circulatory equilibrium. The myocardium is made up of a multitude of scrolls of fibers, each constructed of a syncytium of myriads of heart muscle cells. It is in these finite units that some change has taken place that interferes with their proper function and consequently the function of the mass as a whole. The functional capacity of the cell is intimately associated with its metabolism in a physicochemical or probably more properly a chemical process. Recent epoch-making discoveries[1 2 3 4] concerning the chemical mechanism of striated muscle contraction and its relation to phosphocreatine have caused us, among others, to seek the explanation of myocardial insufficiency in chemical changes in the muscle cells in the heart. Microscopic anatomical changes sufficient adequately to explain failure have often been found wanting by most of us in the large beefy heart of a patient with essential hypertension who has died in congestive heart failure.

Constabel,[5] as early as 1921, found a decrease in the creatine content of human hearts that were fatty, friable and flabby as result of

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*From the Department of Practice of Medicine, University of Texas School of Medicine.

diphtheria, tetanus, typhoid, septicemia or cachexia. The decrease in the creatine content of the heart muscle was considered to bear a relationship to the heart's functional state and tone. Calhoun, Cullen, Clark and Harrison[6] found the potassium content of failing cardiac muscle to be distinctly low, and considered the loss of potassium to be a significant chemical factor in heart failure. Scott's[7] findings on hearts supplied by me from the heart station in Charity Hospital in New Orleans in 1928-1930 agreed with this contention. Seecof, Linegar and Myers[8] extended the observations on the creatine content of human hearts. These investigators found increasing values for creatine with increasing age, and with increasing weight of the ventricle, with higher concentration in the left than in the right ventricle.

Cowan[9] has supplied further evidence that there is a disturbed creatine metabolism in functionally insufficient hearts, as was suggested by Constabel's work. In a series of 17 human hearts from patients who had died of congestive heart failure, Cowan found low total creatine values in 11 of the 17, these low values ranging from 92 to 152 mg. per cent, while the normal mean was 202 mg. per cent plus or minus 37. In a similar series analyzed under my direction in my laboratory by George Decherd, W. O. Brown and Peter Erhard, these findings were corroborated in the essential. In the hearts of 13 patients who had died of congestive failure, the creatine values were consistently low, averaging 111 mg. per cent with a range of 85 mg. per cent to 132 mg. per cent. The detailed findings are shown in Tables 1, 2 and 3.

That there are significant losses in the total creatine content of the chronically or acutely failing heart muscle seems to be well established. We have also found the creatine content of myocardial infarcts to be sharply decreased below the level found in the uninvolved heart muscle.

In order further to extend our thesis it was

Table 1

HYPERTENSION AND CORONARY DISEASE CONGESTIVE FAILURE

Age	Sex	Heart Wt. in Gm.	Creatine Mg. Per Ct.	Per Ct. Solids
60	m	450	123 (620)	20.2
87	m	790	99 (557)	17.8
56	f	400	108 (514)	20.9
42	f	550	96 (504)	19.
43	m	480	129 (608)	19.5
83	f	575	128 (653)	19.6
75	m	475	132 (643)	20.5
46	m	1060	107 (502)	21.3
49	m	480	116 (439)	21.4
70	m	560	85 (543)	18.75
54	f	410	125 (583)	21.5
45	m	650	95 (700)	18.5
67	m	520	106 (512)	20.7
Average			111 (561)	

Table 2

CHRONIC SYPHILITIC AORTIC DISEASE

Age	Sex	Heart Wt. in Gm.	Creatine Mg. Per Ct.	Per Cent Solids
28	m	600	110 (527)	20.9
46	m	430	121 (611)	19.89
38	f	510	137 (423)	22.5
39	m	390	128 (599)	21.6
	m	470	116 (459)	22.7
35	f	230	121 (586)	20.6
30	m	300	126 (633)	19.9
33	f	380	133 (578)	23.0
34	f	560	118 (482)	24.5
50	m	540	120 (600)	20.0
Average			123 (549)	

Table 3

MISCELLANEOUS

Age	Sex	Heart Wt. in Gm.	Creatine Mg. Per Ct.	Per Cent Solids
Acute pericarditis				
8	f	310	105 (566)	18.5
55	f	450	113 (525)	21.5
Acute or chronic infectious diseases				
19	f	260	160 (890)	17.9
55	f	230	143 (663)	21.6
30	m	190	123 (590)	21.0
9	f	120	152 (832)	18.3
10	f		140 (693)	20.3
63	m	440	140 (725)	19.4
Acute toxic states				
	m	340	169 (842)	20.1
55	m	400	144 (640)	22.5
Stillborn				
	f		143 (762)	18.75
Arteriosclerotics				
60	m	380	140 (335)	21.8
52	f	395	152 (488)	21.2
Chronic nephritis				
40	m	680	155 (690)	22.5
Traumatic and surgical conditions				
79	m	280	154 (626)	24.5
30	m		161 (810)	19.9
54	m		148 (712)	20.7
72	m	320	138 (617)	22.4
60	f	300	154 (438)	25.2
	m	430	143 (705)	20.2
48	m	190	149 (755)	19.7
53	m	230	158 (610)	26.0
19	m	425	183 (663)	27.6
27	f	230	179 (727)	24.4
40	f	220	164 (698)	23.5
31	m	310	145 (666)	21.8
69	m	350	175 (845)	20.7
75	m	500	153 (694)	22.0
43	m	300	157 (842)	18.6
Undetermined causes of deaths				
18	m	275	176 (875)	20.4
40	m	300	175 (772)	22.75
65	m	210	205 (901)	22.8

We wish to acknowledge indebtedness to Professor Paul Brindley, of the Department of Pathology, for his cooperation and that of his staff in providing human material for chemical analysis.

necessary to resort to experimental biochemical studies.

Extensive biochemical experiments performed on animal tissues during the past two years have demonstrated a close association of creatine metabolism with that of phosphates, glycogen, lactic acid, glucose, potassium, oxygen and insulin. It has long been appreciated that most important parts are played by oxygen, glucose, insulin, lactic acid, and glycogen in the heart as well as in skeletal muscle physiology.

The close relation of creatine to glycogen metabolism in skeletal muscle action has been stressed by the English school. The Eggletons,[2] it will be remembered, gave the name of "phosphogen" to a labile substance that they found responsible for muscular contraction. Phosphagen, according to their description, was an unstable organic hexosephosphate, phosphoric ester of glycogen, or a precursor of both lactic acid and lactocidigen.

In this country Fiske and Subbarow[1] had already described a similar substance as phosphocreatine that they considered to exist in the muscle cell wholly as secondary potassium salt, a combination of one molecule of creatine and one of phosphoric acid. The substance was found to be relatively stable in an alkaline medium, but hydrolyzed with increasing velocity as the hydrogen ion content rose. They found phosphocreatine to maintain a fairly constant relationship to glycogen in skeletal muscle, both decreasing equally under aerobic condition. In anaerobiosis, however, the phosphocreatine was found to disappear more rapidly than the glycogen and the ratio dropped. Clark and the Eggletons[3] suggested that the contractile process in cardiac muscle as well as that of skeletal muscle depends upon phosphagen breakdown.

Vollmer,[4] studying the creatine content of the resting heart muscle of the frog, found phosphocreatine constituting 75 to 80 per cent of the total creatine. After stimulating this slow-beating, thin-walled, cold-blooded heart and dropping it into liquid air at the end of contraction, Vollmer found the phosphocreatine to have dropped to 25 per cent of the total creatine. Bollmann and his collaborators have attempted, in heart lung preparations, the technically difficult studies of phosphocreatine in the mammalian heart. They have not been able to confirm Vollmer's findings. However, it must be remembered that the thick-walled, rapidly beating dog's heart cannot be stopped instantaneously, so easily and completely in exactly the same phase of contraction, even by plunging it into liquid air. The discordant results may be accounted for in part by these considerations.

THE PRESENT STUDIES

In addition to the chemical studies of human heart muscle, we[10 11 12 13 14 15 16 17] have carried out various experimental procedures on several series of mammalian hearts and then analyzed the muscle. We wish to present the experimental evidence that has been thus far accumulated. The total creatine content has been the object of most of our chemical analyses. We have had to be content in most instances with determinations of changes in the level of creatine. Creatine fluctuations we consider as most significant as well as the most consistent changes. In some experiments, however, we have made simultaneous studies of the glycogen, lactic acid, phosphates, potassium and calcium. Changes in the total creatine content reflect changes in the phosphocreatine of the living muscle.

MYOCARDIAL INFARCTION STUDIES

In a series[13] of 15 dogs under nembutal anesthesia and adequate interrupted air pressure respiration, we opened the left pleura and pericardium just over the anterior descending branch of the left coronary artery. We then placed a ligature around the arterial branch only and produced an acute myocardial infarction of the anterior wall of the left ventricle. The pericardium and chest wall were closed and the animals maintained under nembutal anesthesia with artificial respiration for as long as twelve hours. After varying intervals of time, from 15 minutes to 12 hours after ligatures were placed, blocks were removed from the beating hearts, both from the normal areas and the infarcted areas. These living contracting myocardial masses were macerated in cold alcohol for comparative glycogen studies while corresponding sections were dropped into sulphuric acid for digestion and total creatine determinations.

Analysis of the material thus collected showed that there was an immediate drop in the glycogen content of the infarcted muscle, as contrasted with the level in the uninfarcted muscle. This glycogen loss was maximum in five hours and continued about this level. The drop in total creatine was found to be definite in the five-hour infarction specimen and continued to increase slightly throughout the series up to

12 hours. These data indicate to us that the acute ischemia and anoxemia lead to a prompt destruction of the glycogen and probably also of the phosphocreatine. The loss of creatine, however, does not begin until the permeability of the cell membrane is increased by cellular death (*Chart 1*).

Himwich and his coworkers[18] have demonstrated a similar loss of glycogen and a rise in lactic acid in infarcted heart muscle, but no creatine studies were made on their material.

INFARCTED RABBIT HEART SERIES

Decherd and I[12] found the very lowest total creatine values that we have thus far encountered in a series of infarcted rabbit hearts (*Chart 2*). These hearts had been perfused for six to eight hours in our modified Dawson-Gunn-Locke apparatus with Ringer-Locke solution that was oxygenated and warmed. To this solution in most experiments one or another of the various amino acids that have been considered possible creatine percursors, and creatine itself, had been added. The perfusion alone of control rabbit hearts with the Ringer-Locke solution, warmed and oxygenated, or with insulin added, resulted in a fairly uniform drop in total creatine content in the hearts that stopped in failure after several hours. A fall in the pH of the perfusate due to lactic acid accumulation caused an added loss of creatine (*Chart 3*). The low tolerance of the mammalian heart for lactic acid acidosis was demonstrated by Katz and Long.[19] It was noted in myocardial exhaustion with the average concentration of 0.072 gram per cent. Perfusion of the beating rabbit heart, uninfarcted as well as infarcted, with the Ringer-Locke solution, oxygenated and warmed and with glycocoll, arginine, glutamic and aspartic acid, methylguanidine or glycocyamine and other chemically related or possible precursors and even creatine itself added, failed to maintain a normal creatine value (*Chart 2*). Alanine alone, of all the aminoacids, seemed to spare the creatine, probably as a result of its protein stimulating prop-

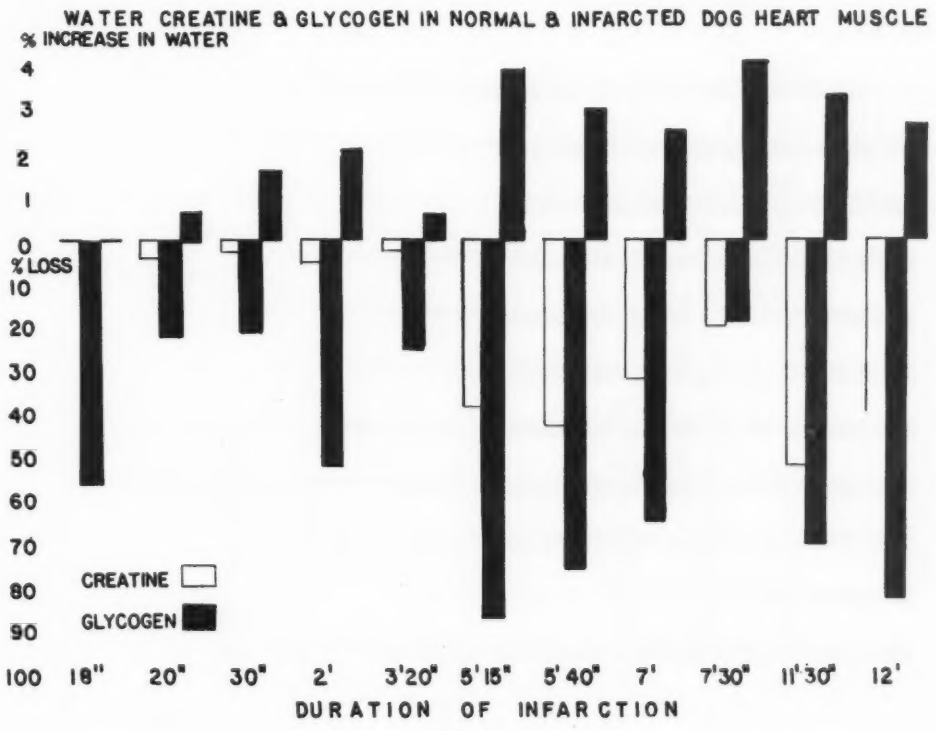

Chart 1

erties, as Professor B. M. Hendricks has suggested.

THE EFFECT OF MYOCARDIAL DESTRUCTIVE AGENTS ON THE CARDIAC CREATINE LEVELS IN RABBITS

In order to study the creatine changes in damaged heart muscle we have used the method of Fleisher and Loeb[20] for the production of acute myocarditis.[15] This involved the intravenous administration of caffeine or sparteine followed in a few minutes by epinephrine intravenously. The microscopic and electrocardiographic sequelae of caffeine epinephrine injections has been carefully studied by Christian and Walker[21] and Johnson and Siebert.[22] The latter found microscopic evidence of edema within ten minutes after injections. Degenerative changes in the muscle fibers became evident within 48 hours. Connective tissue proliferation was detected on the sixth day and progressed for 12 to 21 days, then gradually receded, returning to about normal in six weeks. We found these anatomical changes to be accompanied by chemical changes. Ten per cent of the animals that died immediately after injection showed fairly normal creatine values, varying from 140 to 185 mg. per cent, with an average of 168 mg. per cent, the upper limit of normal. Twenty per cent of the animals that died within 18 to 24 hours after the injection of caffeine epinephrine showed strikingly low creatine values even after the heart muscle weight was corrected for the edema content. Other spontaneous deaths which occurred up to the twentieth day likewise showed distinctly low creatine values.

The animals that were watched very carefully and promptly sacrificed with appearance of irregular heart action and convulsions, the pre-agonal signs of imminent death, showed normal or slightly lowered myocardial creatine values. Those sacrificed at intervals without any signs of impending death, most showed car-

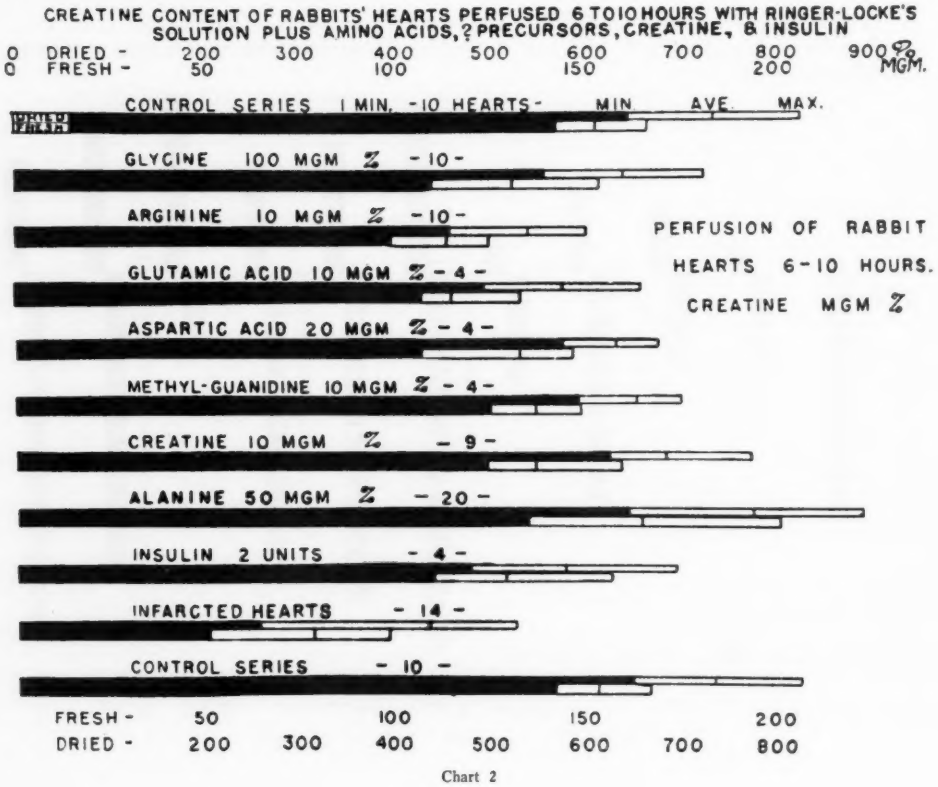
CREATINE CONTENT OF RABBITS' HEARTS PERFUSED 6 TO 10 HOURS WITH RINGER-LOCKE'S SOLUTION PLUS AMINO ACIDS, ? PRECURSORS, CREATINE, & INSULIN
0 DRIED - 200 300 400 500 600 700 800 900 Z MGM.
0 FRESH - 50 100 150 200
CONTROL SERIES 1 MIN. -10 HEARTS- MIN AVE MAX.
GLYCINE 100 MGM Z -10-
ARGININE 10 MGM Z -10-
GLUTAMIC ACID 10 MGM Z -4-
ASPARTIC ACID 20 MGM Z -4-
METHYL-GUANIDINE 10 MGM Z -4-
CREATINE 10 MGM Z -9-
ALANINE 50 MGM Z -20-
INSULIN 2 UNITS -4-
INFARCTED HEARTS -14-
CONTROL SERIES -10-
PERFUSION OF RABBIT HEARTS 6-10 HOURS.
CREATINE MGM Z
FRESH - 50 100 150 200
DRIED - 200 300 400 500 600 700 800

Chart 2

diac creatine content seemingly somewhat elevated during the first two to twelve hours, after which the creatine gradually dropped off. The findings were somewhat irregular and with considerable variations, due probably to the inevitable differences in the amount of myocardial damage accomplished. During the third and fourth weeks the values tended to rise toward the normal. Thus, within the first 12 hours the creatine seemed to be increased, after 12 hours the drop began, and when this loss amounted to 25 to 30 per cent of the normal, the critical point was reached and the animal usually died. If the creatine does not fall below this 70 per cent of normal and stops short of this, the animal survives and recovery takes place. There is no doubt that after this critical point is passed reparative processes may intervene and the creatine content will rise back toward normal. All of these changes take place without apparently any demonstrable changes in the myocardial glycogen.

In another series of normal healthy rabbits irradiation by Dr. H. C. Harrell with a deep therapy machine to the extent of 4,000 to 6,000 r units has been used in hopes of producing chemically demonstrable myocardial changes. Chemical analyses of heart muscle from such animals, however, failed to reveal any creatine or glycogen changes that could be considered significant.

CREATINE CONTENT IN EXPERIMENTAL HYPERTROPHY

In another series studied with E. H. Schwab,[17] an experimental cardiac hypertrophy that might be considered more comparable with the human type was produced in a series of rabbits by sectioning of the aortic leaflets. The hearts that showed moderate hypertrophy were found on analysis to have relatively increased as well as absolute increase in creatine content. As the grade of hypertrophy increased the relative concentration of creatine dropped to normal and slightly lower levels. In spite of this relative percentage drop in creatine in the presence of great work hypertrophy the actual creatine content of the individual heart was distinctly ele-

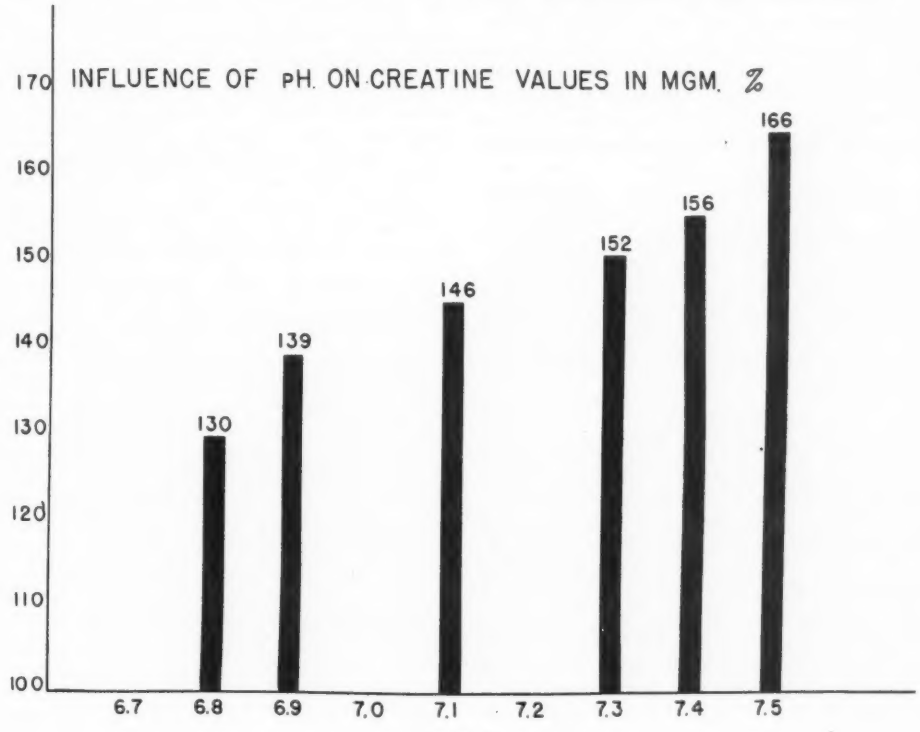

Chart 3

vated. There was a slight decrease in total solids, especially of the left ventricle, indicating a slight increase probably in intracellular fluid content.

These findings are at slight variance with Cowan's figures from rats' hearts that were hypertrophied as a result of nutritional anemia or thyroid intoxications, following which a striking relative decrease and no elevation of the total content were demonstrable. Nutritional anemia and thyroid administration are known to disturb creatine metabolism and produce a type of hypertrophy that is not directly comparable with work hypertrophy.

CREATINE VALUES AFTER DIGITALIZATION

It was interesting to find in a series of normal rabbits that were digitalized for four weeks and another series digitalized for 14 to 18 weeks that the creatine levels and content slightly but definitely increased while the total solids decreased slightly.

Combining the effects of hypertrophy and digitalization by the administration of the drug subcutaneously in 0.1 cat unit per kilo to the rabbits with experimental aortic regurgitation yielded significant data. In the animals with small aortic defects and consequently slight to moderate hypertrophy, digitalization for three to four months had apparently produced combination effects, namely, the highest creatine contents that were obtained in our experimental studies. Furthermore, in those rabbits with great hypertrophy the digitalization seemed to offset the percentage drop that hypertrophy alone had been found to produce. In other words, normal or slightly elevated percentages were maintained and consequently the total creatine content of such hearts was greatly increased.

COMMENTS

The clinical experimental biochemical facts seem to point the way toward the ultimate solution of the problem of myocardial weakness or heart failure. There are, of course, still gaps in our knowledge.[23] The most logical deduction from the mass of data concerning the physical mechanism of heart failure and ten years of clinical and experimental work lead Harrison[24] to the conclusion that the chief factor in heart failure is anoxemia, an actual reduction of the diffusion of oxygen into the heart muscle cell. The thickened heart muscle cell of compensatory hypertrophy in itself impedes oxygen diffusion; the arteriolar and arterial sclerosis add some further barrier to maximum and adequate oxygenation. These factors alone lead to an anoxemia of heart muscle, and this in turn may initiate a train of chemical changes that further impair the heart's functional capacity.

At this point we may point out the effect of inadequate cellular oxygen supply on cellular metabolism; the synthesis of muscle glycogen is interfered with, the lactic acid that results from glycogen breakdown during contraction is not completely resynthesized, and accumulates; an acidosis results as the organic acid uses up the buffers of the blood.

The phosphocreatine breakdown to creatine and phosphate liberates the energy of contraction even under anaerobic conditions, but the fairly constant relationship of aerobiosis is lost and the phosphocreatine disappears more rapidly than the glycogen, and the ratio falls. The increasing pH likewise speeds up the velocity of phosphocreatine hydrolysis and this may well hold the concentration at a low level and interfere with resynthesis and thus contribute to myocardial weakness.

The potassium ion of the creatine phosphoric acid secondary salt may be lost under the conditions of anoxemia. Calhoun, Clark and Harrison[6] and Scott,[7] from the study of the chemistry of human heart muscle from patients dying in heart failure, consider the loss of potassium of primary importance. Burger's[25] report on the effect of the lactic acid on the potassium loss from cells is of interest in this connection.

The resynthesis of the phosphocreatine after the contraction apparently depends upon the energy liberated by the delayed lactic acid formation. Some lactic acid is oxidized to carbon dioxide and water, but in anoxemia there is a rapid accumulation of lactic acid in the tissues and the blood and the mammalian heart does not tolerate any concentration above 0.07 gram per cent without showing signs of exhaustion. The analysis of such exhausted hearts shows very striking losses in total creatine content. It is therefore reasonable, in view of the facts known about phosphocreatine's relation to cardiac energy, to consider heart failure a matter of disturbed glycogen-phosphocreatine metabolism, as indicated in *Chart 4*.

IN SUMMARY

(1) Low cardiac creatine values accompany human heart failure, probably as a result of sub-

SCHEMA OF

MYOCARDIAL FAILURE IN TERMS OF PHYSIOLOGICAL CHEMISTRY

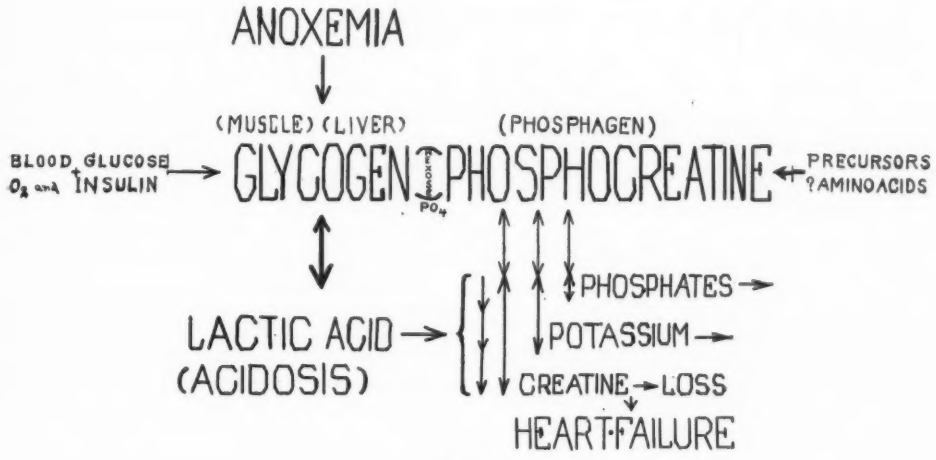

Chart 4

oxidation or anoxemia and disturbed myocardial cellular chemistry.

(2) The heart muscle from infarcted areas contains the lowest concentrations of creatine and glycogen.

(3) Infarcted rabbit and dog hearts exhibited the greatest losses of creatine, and glycogen.

(4) Isolated rabbits' hearts perfused to failure show greatly decreased creatine percentages. Alanine alone of all the amino acids seemed to act as a creatine sparer.

(5) Experimental myocarditis in rabbits caused drops in the cardiac creatine levels.

(6) Irradiation did not seem to change the chemistry of the heart muscle.

(7) Work hypertrophy of experimental aortic lesions in moderate degree produced relative and actual increases in cardiac creatine. In great hypertrophy the relative values drop, but the actual content is elevated.

(8) Digitalization increases the creatine concentration in normal hearts.

(9) Digitalization of hypertrophied hearts keeps the relative creatine percentage high and thus further adds to the increased total creatine of the work hypertrophy.

(10) A biochemical conception of heart weakness and myocardial insufficiency seems to be fairly well established.*

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*See Chart 4.

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THE PATHOGENESIS OF CIRCULATORY FAILURE*

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Failure of the circulation is of two general types according to whether the heart or the peripheral vascular apparatus is primarily at fault. The failure to recognize the facts that the two types of circulatory failure are dependent on entirely different functional disturbances, and that they are associated with distinctive clinical pictures, has led in the past to much unnecessary confusion.

PERIPHERAL CIRCULATORY FAILURE

When for any reason the venous return of the heart becomes inadequate and a sudden diminution in the blood supply to the body thereby results, a characteristic syndrome appears. The chief subjective manifestation is weakness. Mental apathy, stupor and, in severe cases, unconsciousness may occur. The more sudden the onset the graver are the mental disturbances. The most important objective findings are rapidity and weakness of the pulse, diminution in the systolic blood pressure followed at a later stage by decline in the diastolic value as well; coldness of the skin, which is usually abnormally moist; decline in body temperature, and in certain cases feebleness of the heart sounds, the first and second sounds often resembling each other in quality. The patient prefers to lie flat in bed, the veins are empty, edema cannot be demonstrated, and dyspnea is either absent or of minimal severity.

This clinical picture of acute peripheral circulatory failure has usually been designated as "shock" or "collapse." I have preferred to call it the hypokinetic syndrome because it is dependent on a diminution in the fundamental function of the circulatory apparatus, that of keeping an adequate amount of blood moving through the tissues. Such a physiological derangement may be initiated by a number of different processes and acute peripheral circulatory failure may accordingly be classified into several different groups:

(1) The hematogenic type, which is dependent on a diminution in blood volume, is best exemplified by acute hemorrhage. The recent investigations of Blalock and of others have shown that the syndrome of traumatic shock is also mainly due to loss of fluid from the blood stream into the injured tissues. Severe dehydration, such as accompanies burns, profuse diarrhea and excessive vomiting, may likewise produce this picture.

(2) The neurogenic type is dependent on vasodilatation as the result of influences acting through the nervous system. The simplest example is ordinary syncope, which usually is dependent on psychic insults. Reflex vasodilatation may also occur, as is illustrated by the effect of blows to the jaw or the region of the solar plexus, and also by the effects of carotid sinus pressure. (In these conditions sudden slowing of the heart as the result of vagal stimulation may also play a role in the lowering of the blood pressure.) Vasodilatation, because of direct interference with the normal passage of vasomotor impulses such as occurs following injury to the spinal cord or with "high" spinal

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anesthesia, is another example of the neurogenic mechanism of acute circulatory failure.

The circulatory collapse which follows muscle trauma was formerly ascribed to the liberation of toxic products into the injured tissues. The work of Blalock[1] seems to have demonstrated clearly that diminution in blood volume as the result of loss of fluid into the injured area is an important factor in the production of this type of acute circulatory failure. Very recently O'Shaughnessy and Slome[2] have claimed that neurogenic factors also play a role in traumatic shock, for they found that blocking the nerve impulses from the injured tissues exerted a favorable influence on the clinical course. Their work affords an experimental basis for Crile's concept of the importance of reflex influences in traumatic shock.[3]

(3) The vasogenic type of acute circulatory failure results from the action of agents which cause dilatation of the arterioles by direct action on the vascular musculature. The sudden collapse following the administration of nitrites or of histamine is an example of this mechanism. Aside from histamine, which has been subjected to extensive investigation, a number of other vasodilator substances have been shown to be present in certain tissues of the body and to be liberated under certain conditions. Among these compounds are acetylcholine, adenosine, kallekrein and the depressor substance described by Lange[4] and by Major.[5] The exact role played by these various vasodilator substances has not yet been settled, but it seems to be established that some of them at least may, under certain conditions, be responsible for the dilatation of vessels in local areas of the body. Whether the concentration of any of these substances ever becomes great enough in the circulating blood to produce a marked generalized vascular dilatation and consequent acute circulatory failure is still uncertain. There is some evidence which suggests that anaphylactic shock is dependent on such a mechanism.[6]

Not only chemical compounds but also physical agents may be of importance in the production of the vasogenic type of acute circulatory failure. Heat stroke and sunstroke are both presumably dependent in part on vascular dilatation in the skin.

FAILURE OF THE HEART

The common type of heart failure is that characterized by congestion and associated with engorgement either in the pulmonary circuit, the systemic vascular bed or in both of these areas. Congestion of the lungs, which is due to failure of the left side of the heart, is recognized clinically by dyspnea, cough, diminution in the vital capacity, and when the congestion becomes severe enough to produce edema of the lungs, by rales at the lung bases. When the pulmonary congestion develops slowly, as is usually the case in mitral stenosis, the lungs become indurated and fluid does not pass readily through the capillary walls. Under these conditions dyspnea is likely to be constant, but never extremely severe, and acute edema of the lungs is uncommon. However, when the left ventricle fails suddenly, as is frequently observed in persons with aortic insufficiency and in those with hypertension, congestion of the lungs may develop rapidly and dyspnea is likely to occur in paroxysmal seizures, which are termed "cardiac asthma." When the sudden rise in the pulmonary capillary pressure reaches excessive heights the rapid transudation of fluid through the alveoli induces a dramatic and frequently dangerous attack of acute pulmonary edema. This occurs particularly in patients who have not had long-standing congestion and in whom chronic induration of the lungs has not taken place.

Failure of the right side of the heart induces an entirely different clinical picture. In its purest form, that is, unattended by pulmonary congestion, it is likely to be observed in persons with congenital lesions, in those with lesions of the tricuspid valve, and in subjects with extensive pulmonary fibrosis. Individuals who survive for a number of hours following pulmonary embolism may likewise exhibit the picture of failure of the right side of the heart. Regardless of its initial cause, this syndrome is characterized by distention of the veins, engorgement of the liver, edema of the dependent portions, accumulation of fluid in the body cavities and albuminuria. Dyspnea may be marked on exertion, but is slight at rest, and the patient is often able to lie almost flat in bed without discomfort.

For the sake of clarity the syndromes of failure of the two sides of the heart have been described separately. Actually, they frequently coexist, for left-sided failure is much the most common cause of right-sided failure. Since the common underlying causes of heart disease usually affect the left side of the heart, congestion in the pulmonary area ordinarily precedes that in the systemic vascular bed. The increasing

pulmonary pressure eventually leads to failure of the right side of the heart. It is therefore frequent to observe failure of the left side of the heart without that of the right, but the reverse is uncommon.

In view of the striking differences between the clinical picture of peripheral circulatory failure and that of congestive heart failure, it is rather surprising that the same mechanism has been believed, in the English-speaking countries at least, to be responsible for both syndromes. However, the work of recent years has clearly established the fact that while diminished blood supply to the tissues is responsible for the syndrome of collapse, an entirely different mechanism is concerned in the production of the picture of congestive heart failure. The concept of back pressure, which was advocated one hundred years ago by James Hope, was abandoned by many clinicians and even ridiculed by some until recently. But the work of the past few years seems to have shown beyond question that backward failure is the chief mechanism concerned in the production of the congestive syndrome. Cardiac edema has been demonstrated to be dependent on a rise in pressure in the systemic veins, while cardiac dyspnea, although a complex symptom and influenced by a number of different factors, is in the main a result of the effects of congestion in the lungs on the sensory vagus terminals. To attempt to go into more detail concerning the evidence for the validity of the back pressure theory would carry us too far afield. This question has been discussed in detail elsewhere.[7 8] Suffice it to say that forward failure of the circulation, that is, diminished blood supply to the tissues, produces the clinical picture of collapse, while backward failure produces the congestive syndrome.

Since the failing heart ordinarily furnishes an adequate circulation to the tissues, but does so only when driven by an elevated venous pressure, it is evident that the condition is one of inefficiency rather than insufficiency. For this reason, congestive heart failure may be designated as the dyskinetic syndrome.

HEART FAILURE SIMULATING PERIPHERAL CIRCULATORY FAILURE

Thus far the discussion of the failure of the heart has been concerned with the type of disorder characterized by congestion. However, all heart failure is not of this type and under certain conditions disorders of the heart may lead to a sudden inadequacy of the blood supply to the tissues and to a clinical picture simulating closely that of acute circulatory failure. Sudden death is an example of this mechanism occurring in extreme degree. The expulsion of blood from the heart may cease either as the result of ventricular fibrillation, which is the usual mechanism in persons dying suddenly of angina pectoris, or because of simple cardiac standstill, which occurs in certain instances of the Stokes-Adams syndrome. The latter disorder more commonly induces syncope followed by recovery, and the attacks exhibit a close similarity to those of simple psychic origin which are mainly dependent on a peripheral rather than a cardiac mechanism. A more frequent cause of collapse due to cardiac disorders is coronary thrombosis. Accumulations of fluid in the pericardium, prolonged attacks of paroxysmal tachycardia and severe diphtheritic myocarditis are also likely to lead to a clinical picture resembling that of acute peripheral circulatory failure.

In all of these conditions in which sudden failure of the heart occurs the clinical picture is likely to be, during the first few hours, that of collapse (that is, forward failure with an inadequate supply of blood to the tissues) and the physical and mental apathy which are so characteristic of diminished cerebral circulation dominate the clinical syndrome. After several hours, if the patient survives, the congestive manifestations begin to become more apparent and one observes a combination of the signs of collapse with those of engorgement. This clinical picture may logically be designated as the hypo-dyskinetic syndrome. When one is faced with a cardiovascular emergency it is of no little importance to remember that if the veins are collapsed the disorder is probably of peripheral origin, while if the veins are distended the initiating process is almost surely in the heart.

A discussion of therapy is beyond the scope of this paper. It is obvious that a rational approach to the management of the various types of circulatory failure depends on a clear recognition of the functional disturbances which one is trying to overcome. It is perhaps not too optimistic to conclude that the principles which have been discussed may furnish a ground-work for such a functional viewpoint in dealing with this common and important group of clinical disorders.

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DISORDERS OF THE HEART BEAT AND CARDIAC FAILURE*

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Disturbances in the rate or rhythm of the heart beat seldom play an important role in the induction of congestive cardiac failure except in those instances in which the heart rate is greatly accelerated, as in paroxysmal tachycardia, or in which rapid heart action is combined with high grade arrhythmia, as in untreated auricular fibrillation. Extrasystoles sometimes produce disagreeable symptoms, but the extra burden which they place upon the heart is ordinarily too small to be of any consequence. Atrioventricular heart block may be associated with Stokes-Adams attacks, and both atrioventricular and intraventricular heart block are clear indications of the presence of serious myocardial disease, but neither shows any tendency to precipitate an attack of congestive failure. In auricular flutter the cardiac rhythm may be regular or irregular; in either case the heart rate is usually greatly elevated and this disorder has the same effects upon cardiac function as paroxysmal tachycardia and auricular fibrillation.

Why should paroxysmal tachycardia or auricular fibrillation tend to precipitate a cardiac breakdown? It is not difficult to give a plausible answer to this question if one is satisfied with general statements expressed in qualitative terms. The data necessary for a quantitative estimate of all the factors involved are not available. A brief consideration of some of these factors, however, may tend to clarify the problem.

Since the heart must beat continuously throughout life, it has less opportunity than the skeletal muscles to store up reserves against emergencies. It must balance its budget over short as well as over long periods of time. When it beats it expends energy, and the liberation of this energy involves chemical reactions in which waste products are produced. Unless the waste products produced by one beat are regularly disposed of, by removal or resynthesis, before the next beat occurs, their concentration must gradually increase until, by mass action or otherwise, they seriously interfere with the reactions necessary to continued cardiac activity. It is also evident that if the cardiac reserve is to be maintained the amount of energy stored per cycle must be at least equal to the amount dissipated. In other words, if recovery does not keep pace with expenditure, the heart must gradually become exhausted and fail.

The quantity of waste products which must be disposed of and the quantity of energy that must be replaced are directly proportional to the amount of energy expended. They are not necessarily proportional to the amount of work performed, for the heart, like other mechanical devices, cannot transform all the energy which it liberates into work; some of this energy is inevitably lost in the form of heat. The work performed by the heart is measured by the product of the cardiac output and the mean pressure against which this output is expelled. The oxygen consumed by the heart during a given period may be taken as a measure of the total energy which it has expended. The fraction of the total energy expended which is converted into work is a measure of the heart's mechanical efficiency.

In auricular fibrillation we observe that when the heart rate is fast there is usually a striking pulse deficit. Many of the beats are preceded

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by a diastolic pause so short that there is no time for adequate ventricular filling to take place. When the nearly empty ventricles contract they put out very little blood or none at all, and even though the energy liberated may be subnormal in proportion to the low tension developed, most of it must be wasted. The efficiency of the heart is therefore substantially reduced.

In the case of extremely fast heart rates, such as usually occur in paroxysmal tachycardia, the situation is similar. Whenever the heart rate rises both systole and diastole decrease in length, but the decrease in the length of the latter is very much greater than the decrease in the length of the former. The length of systole is roughly proportional to the square root of the duration of systole and diastole combined, and the discrepancy in the relative length of systole and diastole increases as higher and higher levels of beating are attained. When the heart rate rises to two hundred or more per minute, as it often does in paroxysmal tachycardia, diastole becomes exceedingly short and ventricular filling is greatly interfered with. Under these circumstances the cardiac output is greatly diminished, the pulse becomes weak and thready, and fainting or other symptoms of cerebral anemia frequently develop. Gangrene of one of the extremities has been observed in paroxysmal tachycardia of long duration.[1] Since the cardiac output per minute and the mean blood pressure are both subnormal, it is clear that the work performed by the heart must be reduced. It would seem, however, that the total energy expended must be far above the normal. The energy expended in raising the intraventricular pressure from its diastolic level to the level at which blood begins to flow out into the pulmonary artery or aorta is wasted when the heart puts out no blood, and must be expended very inefficiently when the amount of blood discharged per beat is greatly reduced. It seems clear, therefore, that the mechanical efficiency of the heart in paroxsymal tachycardia must be extremely low. In the case of the heart lung preparation it has been shown experimentally[2] that in performing a given amount of work the heart consumes more oxygen when it is beating at a fast rate than when it is beating more slowly.

Energy is wasted by the auricles as well as by the ventricles. The incoördinated auricular contractions of auricular fibrillation perform no work and the energy which they liberate serves no useful purpose. In paroxysmal tachycardia the heart rate is often so rapid that the auricular contraction of one cycle is superimposed upon the ventricular contraction of the previous cycle. The auricles, being unable to force their contents into the ventricles, pump them back into the great veins. In doing this they perform useless work and the energy expended is wasted.

We may conclude, therefore, that both in paroxysmal tachycardia and in auricular fibrillation the heart expends a very large amount of energy in proportion to the amount of useful work which it performs. This might be less serious if the processes of restoration could be carried on in a normal fashion, so that the energy expended could be promptly replaced and the waste products produced could be promptly disposed of. We may assume that the speed of these restorative processes is dependent first of all upon the quantity and quality of the blood passing through the coronary arteries, and the intimacy with which this blood comes into contact with the cardiac muscle fibers. The tension in the walls of the heart during systole tends to press blood out of the vessels imbedded in them and to increase greatly the resistance in the capillaries between the muscle fibers. Since the pressure in the ventricular walls during systole is higher than the pressure in the aorta, the effective coronary blood flow and the velocity of the restorative processes must be greatest during diastole. It is probable that these processes are, because of their nature, practically confined to this period. A pronounced curtailment in the duration of diastole, therefore, seriously interferes with cardiac recovery even when the blood flow remains normal. In auricular fibrillation and in paroxsymal tachycardia, however, the total blood flow is greatly reduced. This factor adds to the unfavorable effect of the shortened diastole upon the nutrition of the heart and the velocity of its recovery. In these conditions, therefore, the heart is handicapped not only by its lowered mechanical efficiency, but also by pronounced slowing of the processes which ordinarily prevent cardiac fatigue.

The rate of the human heart in paroxysmal tachycardia is never so fast as the normal heart rate of many small animals, and the question arises as to why the human heart is unable to sustain rates that are easily borne by hearts of smaller size. Harrison[3] and his collaborators have attempted to answer this question. They found that the mean thickness of the fibers of

the heart is considerably greater in large than in small animals, and pointed out that the speed of recovery is much greater for thin than for thick fibers. A thick fiber recovers more slowly than a thin fiber because, as a whole, it is in less intimate contact with the blood; more time is required for an adequate supply of oxygen to diffuse to its central portions. The data given by Harrison and his associates suggest also that the duration of systole is somewhat less in small animals with very fast heart rates than it would be in man if the heart rate were raised to the same level.

In the treatment of cardiac failure we attempt to reduce the work of the heart, to increase its mechanical efficiency, and to do whatever can be done to stimulate the restorative processes. In auricular fibrillation and in paroxysmal tachycardia the excessive heart rate is often the chief cause of the cardiac disability, and we therefore attempt to reduce it. In the former the irregularity is an added disadvantage, but as the heart rate comes down the grade of the arrhythmia usually decreases to a point where it is not of great consequence. There is, however, a great difference in different cases as regards the number of ineffective beats which occur at a given heart rate. If the number of such beats remains large when the heart rate has been brought within normal limits much may be gained by the restoration of normal rhythm.

In paroxysmal tachycardia the abnormal rhythm ordinarily comes to an end spontaneously within a few hours; if it does not the attack can usually be terminated by carotid sinus pressure or by the administration of digitalis, quinidine, quinine, or acetyl-beta-methylcholin. When these measures fail to restore normal rhythm they do not ordinarily reduce the heart rate, but occasionally a moderate fall in rate follows the intravenous administration of quinine or of a large dose of digitalis, even when the abnormal rhythm persists. In auricular fibrillation it is almost always possible by giving a sufficient quantity of digitalis to bring the heart rate down to the desired level. Quinidine is used less now than it was a few years ago, but may be employed in carefully selected cases to restore the normal cardiac mechanism. Auricular flutter is a close relative of auricular fibrillation and may be treated in the same way.

In the digitalis treatment of auricular fibrillation we try to give enough of the drug to reduce the heart rate to somewhere in the neighborhood of seventy beats per minute while the patient is at rest and to maintain it at that level. This is about the average heart rate in healthy subjects, and experience has shown that patients with auricular fibrillation do well under this treatment.

In exophthalmic goiter the basal heart rate is ordinarily increased in about the same proportion as the basal metabolic rate. The increase in heart rate presumably represents a physiological response to the need for an increased flow of blood. It has already been noted that the normal heart rate in small animals is much faster than in large animals, and the reason apparently lies in the greater expanse of body surface, and therefore greater loss of heat per unit mass in the former as compared to the latter. In man exertion, fever and other factors which increase metabolism increase the heart rate in approximately the same measure. The question arises, therefore, as to whether in cases of exophthalmic goiter complicated by auricular fibrillation we should attempt to reduce the heart rate to the same level as in cases of auricular fibrillation in which the metabolic rate is not elevated. Experience seems to give an affirmative answer to this question, but there is an old proverb to the effect that "experience is fallacious."

We have, as a matter of fact, comparatively little information regarding the optimal heart rate and the nature of the factors which determine it. It is certain that extremely rapid heart rates greatly reduce the total blood flow, and that extremely slow heart rates must have the same effect, for it is clear that the ability of the heart to compensate for a reduction in heart rate by an increase in its output per beat is limited. We know that very fast heart rates and suspect that very slow heart rates tend to precipitate cardiac failure by lowering the mechanical efficiency of the heart and interfering with its nutrition. On the other hand, we see patients with complete heart block and a heart rate in the lower thirties, and we see normal subjects with a heart rate almost as slow who suffer no obvious inconvenience as a result of their bradycardia. In complete heart block the ventricular rate is not as a rule under the control of the extrinsic cardiac nerves, and in some instances does not increase materially on exertion. In spite of this, patients with this disorder can often engage in all the ordinary activities of life without distress. We also see

apparently healthy subjects who display a heart rate well above one hundred per minute, when they are up and about, and nevertheless appear to possess a normal cardiac reserve.

It must, however, be admitted that these observations do not necessarily mean that for a given heart under a given set of conditions there is not an optimal heart rate. So long as the heart has a reserve of energy and a reserve of blood supply more than adequate for all its needs, it does not matter whether or not it is operating at its maximum mechanical efficiency. When, however, the heart is handicapped by disease which increases its work, reduces its store of energy, or interferes with its nutrition, it may be eminently desirable that its mechanical efficiency be as great as possible. Under these circumstances it would be worth while to know how to determine the optimal heart rate and to be able to maintain the heart rate at that level. Unfortunately we lack the knowledge which would enable us to do either the one or the other. In the absence of such knowledge we must be guided by our clinical experience and do the best we can.

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THE TREATMENT OF CONGESTIVE HEART FAILURE*

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As stated by the previous essayists participating in this symposium, congestive heart failure simply means that the heart muscle has become weakened either from disease or strain and is no longer able to carry on adequately its work of supplying the tissues of the body with wholesome blood. Failure of the myocardium is variable in degree, depending largely on the age of the patient and the pathological lesion responsible for the inefficiency. The onset of failure, no matter what the etiological agent, is a major event in the patient's life and clearly indicates a time from which his activities are to be curtailed.

When the heart fails there are certain unmistakable symptoms and signs which are usually quite evident, such as easy fatigue, shortness of breath on exertion, palpitation, chest pain or misery, cough, engorgement of the veins of the neck or upper extremity, pedal edema, enlarged liver, gallop rhythm, pulsus alternans, and so on. The early recognition of any of the above symptoms or signs and the immediate institution of a rational form of treatment will save much of the patient's time, prolong his life, and prevent early disaster.

The objects of any form of treatment in congestive heart failure are: (1) to restore the myocardium structurally and functionally to as nearly normal as possible; (2) to relieve the effects of failure such as pain, dyspnea, edema, mental anxiety, etc.; (3) to establish a method of living for the patient commensurate with the ability and function of his heart to perform work. In considering the above principles we have at hand certain therapeutic aids which have been tried over a long period of years and are considered most useful in the care of these patients; such as rest, diet, relaxation, psychotherapy, drugs and special procedures which are available, according to the demands of the individual patient.

Rest.—In congestive heart failure rest is one of nature's own methods of treatment and is the most valuable aid at our command. Of course, we know that the heart can never rest, but there are many methods available for decreasing the amount of work which this organ has to do. Complete bed rest is by no means necessary for all patients with heart failure. The amount of rest to be prescribed is purely an individual problem and will depend entirely on the extent of failure present. Shortness of breath produced by exertion can be well handled if the patient is taught to stay within his limit of capacity and to avoid exercise up to a point which produces the shortness of breath. In the event dyspnea is present at rest or is brought on by the mildest exertion and there are obvious signs of peripheral stasis such as marked cyanosis or edema, absolute bed rest is indicated. By this is meant total relaxation of the patient under the constant supervision of a nurse, if possible, or, if not, an attendant who will care for the needs of the individual concerned during the entire 24-hour period.

It is well known that the great majority of

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patients with congestive heart failure are unable to assume a recumbent posture. The position in bed which gives the patient most comfort is the one which should be assumed. For those with marked failure, the sitting posture affords most ease, since it facilitates better drainage of the cervical veins, allows greater use of the diaphragm and chest muscles in respiratory movements, and prohibits the engorged, enlarged liver from compressing the lungs. For the use of such patients, there have been devised special beds which can be easily regulated to the different positions with the least possible exertion to the patient. Perfect physical rest cannot be complete if the patient is harried by a distressing cough or if dyspnea persists even at rest. It is necessary to utilize measures which will be discussed later for the control of these symptoms.

The majority of patients who are told that they have heart disease without any further word of explanation usually develop an anxious, apprehensive state of mind. This can be greatly diminished and perhaps prevented in a great number of individuals provided the physician will take a sufficient amount of time to explain to the patient the nature of his trouble, the necessity for his cooperative treatment, and that many patients with heart disease live to a ripe old age. Ideal conditions of rest cannot be completely carried out unless some provision is made to protect the patient from well intended but usually damaging visits of friends and family who come by just to "cheer the old boy." Unfortunately, few of us realize the physical and mental exertion necessary to carry on any type of conversation for even a short space of time, which, at best, is quite fatiguing to the cardiac patient.

Diet.—Dietary regulation formerly received considerable attention in the treatment of this type of patient. In those with marked dyspnea and evidence of considerable edema, with diminished urinary output, the diet as suggested by Karrell, consisting of 200 c. c. of skimmed milk four times a day without other fluid or food, is of value but should not be continued for longer than three or four days at a time, after which fruit juices, toast, cereals and other soft, easily digested foods may be gradually added. For the less extreme cases the diet should first appeal to the patient and should consist of ordinary, easily digested foodstuffs supplying the caloric requirements which the individual needs. In times past it has been quite customary to restrict the protein intake in a great many of these patients, since protein by its specific dynamic action speeds up the metabolism of the body and, secondly, the rate and work of the heart. Naturally we should avoid undue amounts of protein in the diet, but we must also remember that a lack of protein below the specific requirements of the patient may result in hypoproteinemia, which in itself may produce edema. The custom of feeding a patient with heart disease five small meals a day, well spaced so that no one single meal will add too much of a load on the circulation, is an excellent idea and should be followed more frequently. Too much salt in the diet in the presence of edema should be avoided, but there is no need to completely restrict this substance. The fluid intake should be restricted in the presence of edema, but as the heart improves the intake can be gradually increased until 1,200 or 1,500 c. c. are taken in 24 hours. After reestablishment of the circulation a diet should be given that will appeal to the patient, for it is reasonable to assume that he will follow such a regime as this which is not too restricted for no particular reason.

The bowels should be kept regulated with mild cathartics. It is to be remembered that marked abdominal distention and straining at stool are severe burdens on an already overtaxed myocardium. The choice of cathartics is of some importance. Drugs given with the idea of eliminating fluid through the bowels, such as saline cathartics, are extremely prostrating to the patient and should be avoided in the majority of instances.

Drugs.—Next in importance to rest are drugs, the most valuable of which in treating severe cases of congestive heart failure is opium or its derivatives. Through its intelligent use it is possible to give the patient relief from anxiety and fear, but most important of all, to relieve his distressing symptoms. The drug must be given judiciously and carefully, in small doses, and withdrawn as rapidly as possible. The barbiturates are also valuable sedatives and can frequently be substituted for morphine and its derivatives. Of great importance is digitalis, and on its intelligent use the future of the patient depends. Far too many physicians use the drug indiscriminately and prescribe it even when there is only suspicion of heart failure. The action of the drug is too well known to describe in this short paper. Mention will be made only of the indication and method for its use. Let it be said that any patient on whom a diagnosis of

congestive heart failure has been made, irrespective of its etiological cause, should receive the benefit of digitalis therapy. The patient should be fully and completely digitalized and maintained in such a state thereafter by daily doses. In computing the amount of drug necessary for complete digitalization, a safe rule is to give 0.1 gram (1½ grains) of the powdered leaf for every ten pounds of body weight, allowing for the daily excretion of 0.1 gram. The rapidity of administration for purposes of digitalization depends on the individual case. With ambulatory patients of average weight, who can be seen regularly, a very satisfactory procedure is to have them take 0.1 gram (1½ grains) of the powdered leaf three times daily after meals for one week. The second week they are told to take the same dose twice daily and the third week one dose daily, which is the maintenance dose. In the event 0.1 gram (1½ grains) is not sufficient for the individual, 0.1 and 0.2 gram given on alternate days may be tried to keep up constant digitalization; or if 0.1 gram is too much, the patient can be instructed to take one dose six days out of the seven. The maintenance dose is an individual problem and can be worked out by the patient and his physician. If rapid digitalization is desired, the patient may be given 0.4 gram (6 grains) of the powdered leaf every four hours for four doses and then the maintenance dose continued. In the event of emergencies or severe vomiting it may be necessary to give the drug intravenously or intramuscularly. There are several preparations for intravenous medication on the market which are quite satisfactory. One c. c. of these preparations is equivalent to 1½ grains of the powdered leaf. It must be remembered that this method is not the one of choice. It has its dangers, and once the drug is in the blood stream, it cannot be withdrawn. It is important that the practitioner should become familiar with one preparation of digitalis and use this to the exclusion of others. The majority of cardiologists prefer the powdered leaf which is standardized by practically all pharmaceutical houses to such an extent that 0.1 gram (1½ grains) is equal to 1 cat unit. Tincture of digitalis may be used instead of the powdered leaf, but it must be remembered that it deteriorates with age and, due to the fact that it is usually prescribed in drop doses, one can never be sure how much the patient actually receives. 1.0 c. c. of fresh tincture is equal to 0.1 gram of the powdered leaf.

Toxic symptoms such as anorexia, nausea, vomiting, diarrhea, giddiness, disturbed color vision, delirium or bigeminal rhythm may occur and if so, the drug should be discontinued for at least 24 to 48 hours, and again cautiously administered. However, it is well to bear in mind that very frequently in congestive heart failure, nausea, vomiting and diarrhea may be present as the result of chronic passive congestion of the abdominal viscera and that digitalis is absolutely necessary to allay these distressing symptoms. Digitalis, used intelligently, is one of the most potent of drugs for a patient with heart failure, but it so frequently is given when not indicated and in such ineffective doses when indicated, that it may become a menace instead of an aid because of the association of this remedy in the minds of patients with severe cardiac disease.

Other members of the digitalis series are sometimes prescribed. Strophanthin or ouabain is a very powerful drug and is usually given intravenously in doses of 1/120 to 1/240 grain every 24 hours. It is necessary to know that the patient has not had any preparation of digitalis within the preceding 48 hours before giving this remedy. Recently a new glucoside of digitalis, introduced to the profession under the name of verodigen or gitalin, has been used to some extent in this country, but rather extensively in Germany. Its action, according to Stroud, is quite the same as that of digitalis. The dosage necessary for optimum digitalization is from 1/10 to 1/16 grain, which is given in doses of 1/80 grain every four hours, requiring from 5 to 8 doses to produce rapid digitalization. The maintenance dosage is from 1/240 to 1/120 grain per day. Because of its potency, careful observation during its administration is necessary, particularly if digitalis has been previously given. In well selected cases, quinidine or quinidine sulphate is of value in helping to control cardiac irregularity due to auricular fibrillation.

Other important drugs in the treatment of congestive failure are the diuretics. If, after rest and digitalization, there remains evidence of peripheral edema, diuretics may be given to aid the elimination of fluid; a number of them are available. The purine derivations, theobromine

sodium salicylate (diuretin), theobromine, theophyllin, and caffeine are helpful. These are given orally but again may produce toxic symptoms such as nausea, vomiting and diarrhea. The two most valuable of this group, theobromine sodium salicylate (diuretin) and theophyllin, are usually given for two or three days at a time and then discontinued. Other diuretics such as ammonium chloride, ammonium nitrate, various bismuth salts, and urea may be given. Urea has proven satisfactory in some cases, but the disadvantages are that the drug must be given in large doses, 10 to 25 grams two or three times daily, and the taste is extremely disagreeable. By far the most effective diuretics are mercurial derivatives. The most satisfactory, least toxic, and most useful is a solution of salyrgan. This can be given intramuscularly or intravenously in doses of 0.5 to 2 c. c. of a 10 per cent solution. The intravenous route is by far the most advantageous. The precautions necessary in giving this remedy are to be sure that no great amount of blood is present in the urine before administration and that the kidneys themselves are not severely damaged. A satisfactory method of administration is to mix the required dose, either 0.5 to 2 c. c. of the solution in 5 or 10 c. c. of physiological salt solution, inject this slowly in the vein once or twice weekly as necessary. If given in larger amounts over an extended period of time, toxic symptoms such as stomatitis or mild gastro-enteritis must be looked for. It has been advised by some that the use of ammonium chloride or ammonium nitrate in doses of 10 to 15 grains three times a day for three or four doses preceding the use of the mercurial derivatives aids in this diuretic action.

Oxygen is of some value in congestive heart failure, particularly in patients with Cheyne-Stokes respiration and in certain individuals with acute coronary thrombosis. For the average patient it is of very little benefit.

Venesection at times, in acute congestive heart failure with edema of the lungs, is life saving. This method of treatment within the past eight or ten years, I feel, has not been utilized often enough in the full-blooded plethoric type of individual who comes with pulmonary edema and all the evidence of heart failure. The removal of 300 to 600 c. c. of blood will frequently give the most astonishing relief.

Paracentesis is frequently necessary for the removal of large collections of fluid within the thorax or within the abdomen. The beneficial results from these procedures, it is scarcely necessary to mention. In those patients with tremendous peripheral edema which remains after all methods of removing it have been tried, one might resort to the use of Southey's tubes. This, however, is a method fraught with danger of intercurrent infection and should be used only under the most aseptic conditions, preferably in a hospital where care of the tubes and the wound can be undertaken by trained observers.

Within recent times a great deal has been written regarding the treatment of congestive heart failure by total ablation of the thyroid gland. Definite conclusions cannot as yet be drawn concerning the therapeutic value of this procedure. Further observation and study are necessary before this type of therapy can be generally recommended. It seems that in certain patients with angina pectoris it has been quite helpful in relieving pain. Whether it has added to their length of life is another question.

After convalescence the patient should be put on a regime of mild but increasing exercise. He should be kept in surroundings as pleasant as possible and as improvement continues, a daily program should be outlined, particular stress being laid upon the factor of staying within the limits of his cardiac reserve and never doing those things which provoke shortness of breath. The possibility of developing cardiac invalidism must be considered and all means possible should be utilized to prevent such an occurrence.

In conclusion let it be said that in the management of congestive heart failure we may never be able to increase the heart's assets, but we can cut down tremendously on its liabilities and all forms of treatment advised or undertaken should be directed with this point of view in mind. There is no set rule for every patient: each one is a law unto himself to be handled as such, intelligently, kindly, and remembering that nature is a great physician and we are called into consultation to aid her and not to wear her out by too many special and sometimes worthless procedures.

CARDIAC NEUROSES*

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The term "cardiac neurosis" is unfortunate insofar as it seems to imply an inferiority in the immediate nervous mechanisms that control the heart. It will be my purpose to show that the disorder commonly spoken of as cardiac neurosis is not at all a disturbance of the heart, not a disturbance of those portions of the sympathetic and vagus that control heart action nor of the intrinsic cardiac nerve, not a disturbance of the neuromuscular conduction paths, but a disturbance of the personality as a whole.

To this general statement some preliminary exceptions must be taken. In vaso-vagal attacks in which a slight stimulation of the skin over the carotid plexus in the neck may produce temporary stoppage of the heart beat with resulting syncope, it would seem that there actually exists abnormal susceptibility to stimulus in a reflex arc. A hug from a man's wife may cause him to fall fainting on her shoulder, the fingers of the barber pressing on his neck as he shaves may produce syncope, merely turning the neck sharply to look behind may bring on such an attack. Such conditions are rare. A similar too delicately balanced nervous control may explain certain of the paroxysmal tachycardias and certain arrythmias, though in these instances suspicion falls most heavily upon the cardiac musculature.

Not far removed from this group lie those disturbances of rhythm and sensation that are attributable to poisons, such as: tobacco and caffeine, which may lead to cardiac irritability or cardiac pain. It is but a step further to that considerable group of cases in which the observer is in doubt as to whether there may not exist myocardial damage, cases in which it is suspected that there may be a larvate tuberculosis, an early thyrotoxicosis. The cold shadow of doubt hanging over the diagnosis may freeze the life out of any effective therapeutic intervention. It must be admitted that in such cases data for an assured diagnosis are often lacking; it is in such instances best to fix on a diagnosis which, though tentative, is definite, and to proceed with a therapeutic plan which may lead to the development of a correct understanding of the case. In these borderline cases we shall certainly not want to invent trumped up etiological factors such as a bad tooth or a suppositious intestinal intoxication to explain disturbances in the heart action that have a neurotic basis.

When all these subtractions are made there still remains a large group of cases commonly called "cardiac neurosis." A half or more of the patients who consult a physician with the complaint of heart trouble have cardiac neuroses. But why should the cardiac neurosis express itself predominantly in cardiac symptoms and spare the other organs and systems? The physician instinctively asks himself this question, and he is frequently unable to find an answer. There often lurks in his mind a vague feeling that perhaps there may be something wrong with the heart after all. He may give verbal assurance as to the soundness of the heart and at the same time accompany this with such advice concerning prudence in regard to exercise that the patient is quick to detect his hidden doubt. Hearty reassurance as to the soundness of the heart often suffices to chase away the patient's anxiety and heart consciousness, but when such reassurances are unsuccessful, the physician again becomes a questioner as to whether there may be some myocardial defect and by his repeated examinations he may betray to the patient his uncertainty.

In order to get some understanding of this problem it must be remembered that the cardiac neurosis is only one of a large group that comprise the organ neuroses. It is unfortunate that our medical studies are rarely directed to this group as a whole. Treatises on the heart, the bladder, the stomach, the colon, the uterus or the vasomotor system end their discussion with a chapter discussing the neuroses as manifested in these several organs. These chapters are often written in an apologetic tone as though nature had made a mistake in permitting symptoms without organic disease, often in the tone of a righteous judge unmasking an impostor. Stokes, the dermatologist, has recently written a paper on the nervous disorders of the skin. What is regrettable about most of these treatises is not the rather casual interest in the subject that is portrayed, but the fact that the impression is gained that the neurosis belongs to the effector organs rather than to the person. This discrete and widely separated consideration of the organ neuroses results in a feeling that there must, after all, exist some structural in-

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feriority in the effector organs, else the neurosis would not have manifested itself there. The more severe the symptoms (and especially when the symptoms are those of violent pain, such as is everywhere produced by the contraction of small segments of ring muscle) the more the physician feels under a strong necessity to discover or invent some explanatory pathologic condition.

When the diagnosis of cardiac neurosis is made, the true diagnosis has just begun. The diagnosis will not be complete until the physician has discovered what are the factors that have made the heart, rather than the bladder or the uterus, the effector organ expressing trouble. These organs, all of them, take part in the physiology of the emotional life. The visceral component of an emotion is so essentially a part of it that without this visceral factor the emotion is inconceivable. It is less with emotion as a state of consciousness than with emotion as a mover of the viscera that the physician is concerned. The several organ neuroses that demand so large a portion of our time and attention are conditioned reflexes in the same sense that Pavlov's dogs' secretion of saliva on hearing a bell ring is a conditioned reflex. The word "reflex" is not to be taken to imply a narrow reflexology. Perhaps conditioned reaction would be a better term to convey the idea that the organism as a whole is concerned in the response. In the conditioned reactions the fundamental vital drives are concerned. The unconditioned reaction is always a total reaction of the organism to a primal drive, and the emotional reactions of the viscera are likewise reactions of the whole.

In other words, these reactions are acquired; they are learned reactions. They are superimposed upon the inborn unconditioned reflex. If we can find out through what steps this conditioning came about, we shall certainly be in a much stronger position to attempt an extinction of the conditioning. The diagnostic study involved in attempting to discover how these reflexes were conditioned is sometimes fruitful of excellent results. The task, it must be admitted, is often beyond our powers, and we are likely to flounder in guess-work. Of the cardiac neuroses it may be said that the factors leading to such conditioning are more readily discovered than in the case of some other organs, the bladder for instance. Most often the emotion involved is fear.

I intended to recite at length some interesting case histories, but I shall limit myself to the subject of neurocirculatory asthenia as it was seen on a large scale during the War. The War gave us an opportunity to observe this syndrome on a large scale, just as the War developed the major hysterias in unprecedented numbers. Whereas in most of the cardiac neuroses the assurance can be given that the heart cannot be at fault because the symptoms of trouble develop independent of exertion, in this so-called "effort syndrome" the symptoms are correlated with exertion in the same way that they are in organic myocardial disease. Fear had become associated with effort. Out of the vast literature that developed on this subject two facts emerge: (1) the sufferers were either of an asthenic habitus or of a cringing temperament. There was no correlation between exposure to strenuous exertion and the development of the effort syndrome. (2) Some men could cure nearly all of these patients; others worked without result. The men who failed were strong in their knowledge of cardiology, but weak in their ability to deal with problems of personality. This word "personality" that we have employed several times, means what? In substance it means the totality of the conditioned reflexes; it means something learned, acquisitions that have come through the conditioning of environment. It was obvious enough that because effort was associated with the terror of the War these men developed a conditioned reflex of an emotional character to effort. Treatment, of course, consisted in making effort attractive and in extinguishing this unfortunate association. In essence it consists in the motivation of confidence, in building up a pride in victorious achievement. Such treatment scarcely lies within the power of a man who looks on the heart solely as a pump and not as a mirror of the emotional life.

Those who have assented to the argument so far as it concerns merely cardiac discomfort or disturbances in rate and rhythm may shake their heads when we come to apply the same line of reasoning to the subject of heart pain. Most cases of angina pectoris occur in patients who show disease of the coronary vessels, but it is well to remember that angina pectoris may occur without coronary sclerosis and conversely coronary sclerosis may occur without angina. Even coronary occlusion may occur without pain; in fact, it is the opinion of Gallavardin as expressed in his book, "Les Angines de Poitrine," that the majority of cases of coronary

occlusion are not accompanied by pain. Many thrombotic scars have been found at postmortems without an antecedent history of pain. In China it is the consensus of a number of physicians that, though every form of cardiac disease known is constantly seen, no cases of angina pectoris have been observed. This is certainly not because the Chinese are insensitive to pain. It is as important that any explanation of cardiac pain should explain as well the absence of pain as its presence. Recent efforts to explain the pain of angina pectoris as due to localized ischemia or anoxemia fall to the ground at once when it is observed that this pain disappears upon the appearance of congestive heart failure or when the heart rapidly dilates. Such a situation would obviously impair still further the circulation in the heart wall, and were the pain due to ischemia, would serve only further to increase the pain. The only explanation of cardiac pain that fits with all the facts is that of Gallavardin and others who assert that angina pectoris occurs in persons who have a certain spasmogenic aptitude. A spasm arising in small segments of an artery produces severe pain, especially when it is sudden and cramp-like. If the whole artery is in a state of chronic contraction, there is no pain. This is a general law that holds good of all the hollow organs and conducting tubes of the body. The pain may be due to a local irritant, a thrombus, a stone, a localized defect in the wall of the tube, or it may occur without any local disease.

Physicians have in general a mystical idea that pain associated with organic disease has a higher worth and dignity than pain without a demonstrable pathologic picture; they lean strongly toward emphasizing the possibility of a lesion and are in some danger of finding such lesions when they are non-existent. If we accept the view that anginal pain is the result of spasm and that spasm may occur in persons without coronary disease, though more readily in those in whom there is the added stimulus to vascular contraction offered by a lesion in the blood vessel wall, we must ask next, how did these people come to have such a spasmogenic aptitude? The only possible answer is that it is a learned reaction; it is a pattern of muscular response that has been acquired long before the development of the painful contraction. An interesting illustration of this conception occurred recently in a paper* from the Mayo Clinic dealing with the rather frequent incidence of typical gallstone colic appearing in patients whose gallbladder with its stones had long since been excised. The pain in these patients is regarded as functional spasm appearing in the nub of gallbladder neck left behind. The circular remnants of gut have become so thoroughly conditioned to spasm on the slightest provocation that even after the removal of the diseased structures they continue to react with typical attacks of pain. The reaction patterns of plain muscle may become so profoundly conditioned that they respond most inopportunely. The action pattern that striped muscle may easily acquire and fixedly retain we see illustrated strikingly in the inability of an adult to speak a foreign language without an accent. Even though here his conscious effort strives to overcome the handicap of early muscular patterns, he rarely achieves complete success and much more is this situation likely to be true in the plain muscles which are out of volitional control.

When we use the words "mental" and "psychic" we are not talking about a reaction of the cerebral cortex alone. Thinking involves the entire organism. It includes the responses of the viscera to the affective element in thought as well as influences coming from the ductless glands and the humors of the body. Thinking involves a reaction of the total organism to the environment and especially to the society in which one lives.

Our own profession offers the best illustration that the spasmogenic aptitude is an acquired reaction pattern. The late Austin Flint, a cardiologist so well known that one of our common heart murmurs is named for him, stated that angina pectoris was so rare a disease that he had seen in five years but a single instance of it. Today the *Journal of the American Medical Association* records weekly the deaths of dozens of doctors from coronary thrombosis and angina pectoris. W. J. Mayo pointed out a few years ago a predilection of anginal attacks for doctors, and particularly for surgeons. It becomes increasingly evident to anyone who studies the subject that the spasmogenic aptitude is a social product; like all of our sentiments and prejudices and tastes it comes by contagion from the attitudes of those about us. It is the attitude of intense concentration, the attitude of a strong, driving impulse that must be reigned in and controlled. All our educators and all our associations are concerned to teach us concentration. To escape becoming victims of the spas-

*Weir, J. F.; and Snell, A. M.: Symptoms that Persist After Cholecystectomy. J.A.M.A., **105**:1093 (Oct. 5) 1935.

mogenic aptitude we would need to have lessons in deconcentration.

DISCUSSION (*Abstract*)

Dr. Hugh J. Morgan, Nashville, Tenn.—I am sure that I express the sentiment of this audience when I state that we are grateful to Dr. Houston for his presentation. No symposium dealing with the clinical aspects of heart disease would be complete without a consideration of the cardiac neuroses. We are fortunate, indeed, to have had the topic considered by a scholarly worker in the field of internal medicine whose knowledge is in no sense confined to the field of psychiatry.

AN EVALUATION OF THE RELATIVE ROLE OF FUNGI (TRICHOPHYTIN) AND OTHER ALLERGENS IN PATIENTS WITH ALLERGIC DERMATOSES*

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This study consists of an analysis of 155 cases of dermatosis seen in the Allergy and Dermatology Clinics of Vanderbilt University Hospital and in the private practice of the author. An attempt is made to answer the question, "How important in our experience is fungus infection as a cause of chronic allergic dermatosis?" With this question in mind, our material has been surveyed with respect to the incidence of dermatoses due to fungus sensitivity, to sensitivity to food and inhalant allergens, and to contact causes. The interrelationship of sensitivity to fungi and to other allergens has been studied. Observations as to the location and severity of skin lesions due to the several allergens have been recorded, and the incidence of other allergic diseases and the presence or absence of family history of allergic disease have been determined. The effect of the removal of offending allergens and the influence of treatment with fungus extracts and extracts of other allergens on the course of the dermatoses have been observed. The material has also been analyzed with reference to the incidence of the dermatoses in the different age groups.

It is well known that many allergic dermatoses are due to hypersensitiveness associated with ringworm infection. The skin lesions due to such hypersensitiveness have been designated dermatophytids (trichophytids and monilids). Sulzberger and Wise,[1] Kerr, Pascher and Sulzberger,[2] Coca,[3] Hill,[4] and others [5-13] have reported studies of fungus sensitivity dermatoses or dermatophytids.

In a previous paper the author[14] reported 33 instances of dermatoses due to fungus sensitivity. Positive skin reactions to the trichophytin and oidiomycin of Lederle and, in a few instances, to the trichophytin of Metz were present in each patient. These reactions, together with the coincident alteration of the skin lesions, established the diagnosis in each instance. Further study, however, revealed that many of these dermatoses, although primarily due to fungus sensitivity, were unfavorably influenced by coexisting sensitivity to the food and inhalant allergens commonly productive of atopic disease.

MATERIAL

The material for this study includes patients with dermatoses of undetermined origin who came to our allergy and dermatology clinics. At first, it was thought that the location of the dermatoses might be a guide as to etiology in selecting cases. Fungus sensitivity was predicted when lesions were present on hands and inguinal regions, contact eczemas when exposed surfaces were involved, food and inhalant sensitivity when lesions were present in the flexures, and so forth. It was soon found, however, that this was frequently not the case. Lesions predominating in any of these places were apt to belong to any one of the above types; that is, atopic dermatoses, fungus sensitivity dermatoses or contact eczema. All dermatoses were considered to be of doubtful origin, and therefore suitable for this study, except those due to known or demonstrable contact causes or those with lesions existing solely on the feet and toes. The latter, it was assumed, were infections with ringworm organisms and not uncomplicated allergic reactions or "ids" and were excluded. All cases were included where the hands or any other parts of the body were involved. Cases of urticaria were not accepted for this series.

METHOD OF STUDY

The patients were questioned regarding previous manifestations of ringworm infection of the feet and were examined for this condition. A large percentage of them either had small le-

*Read in Allergy Clinic and Round Table, meeting conjointly with Southern Medical Association, Twenty-Ninth Annual Meeting, St. Louis, Missouri, November 19-22, 1935.

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sions between the toes or gave a history of having had them. Many were unobservant and denied the existence of lesions, although they were found to be present when searched for. Scrapings from the lesions of the feet were examined for the presence of fungi in only a few instances. If scaling and fissures between the toes were found or reported, the patient was assumed to have ringworm infection. Each patient was then carefully questioned for a history of other personal or family allergic manifestations and for a history of any known contact dermatitis.

Table 1

ETIOLOGY OF DERMATOSES IN MATERIAL STUDIED*

Material	Number
Total number of dermatoses studied	155
Dermatoses etiologically diagnosed	119
Dermatoses due to fungi alone	46
Dermatoses due to fungi plus other allergens	47
Dermatoses in which fungi were involved	93
Dermatoses in which fungi were not a factor	26

One hundred and fifty-five patients with dermatoses are studied. Of these, 119 were diagnosed as to cause. Fungus sensitivity is involved in 93 of these cases; 46 cases, or more than one-third of the total number, are judged to be due to fungus sensitivity alone. Of the remaining 26 cases diagnosed, 3 are contact eczemas and 23 are allergic dermatoses due to either food or inhalant allergens, or to both.

*Obvious contact eczemas were not included in this study.

Table 2

ANALYSIS OF DERMATOSES DUE WHOLLY OR IN PART TO FUNGUS SENSITIVITY

Patients with dermatoses due to fungi alone	46
Patients with dermatoses due to fungi and inhalants	1
Patients with dermatoses due to fungi and foods	7
Patients with dermatoses due to fungi and contact	3
Patients with dermatoses due to fungi, foods and inhalants	33
Patients with dermatoses due to fungi, foods, inhalants and contact	3
Total number of patients in whom fungus sensitivity was considered a factor	93

Table 3

SEVERITY OF DERMATOSES IN MATERIAL STUDIED

	Severe	Moderately Severe	Mild
Patients with dermatoses due to fungi	19	18	9
Patients with dermatoses due to fungi, food and inhalants	24	17	3
Patients with dermatoses due to food and inhalants	12	9	2
Patients with dermatoses due to fungi and contact	2	1	—
Patients with dermatoses due to contact	3	—	—
Undiagnosed	16	14	6
Total	76	59	20

All patients were tested intradermally with 0.05 c. c. of a 1-30 dilution of trichophytin (Lederle) and with 0.05 c. c. of a 1 to 100 dilution of oidiomycin (Lederle) and in a few instances with 0.05 c. c. of a 1 to 50 dilution of another trichophytin (Metz). If these tests were negative or had no effect on the skin lesions they were repeated, using 0.10 c. c. of each extract. In very acute cases we soon learned to test first with small doses (0.01 c. c. or 0.02 c. c.) in order to avoid unpleasant exacerbations of the skin lesions. A positive skin reaction to fungus extracts is usually delayed and of the type of the tuberculin reaction. It constitutes evidence of previous infection only. The diagnosis of fungus sensitivity dermatosis, therefore, was based upon the positive skin test plus an alteration of the dermatosis coincident with the height of the local reaction at the site of testing. A positive skin test with either improvement of the dermatosis coinciding with the height of a moderate local skin reaction at the injection site, or an exacerbation of the skin lesions at the height of an excessive local reaction was taken as evidence that the patient suffered from a dermatitis due wholly or in part to fungus sensitivity. Frequently the tests had to be repeated more than once or twice to assure us that the improvement or exacerbation was not a coincidence.

All patients were skin tested intradermally with forty-two of the most commonly offending food and inhalant allergens. If any of the latter gave positive reactions, or if the history was

Table 4

DISTRIBUTION OF LESIONS IN DERMATOSES DUE TO DIFFERENT CAUSES

	Face or Face and Neck	Hands or Hands and Feet	Exposed Surfaces	Flexures	Generalized	Miscellaneous	Total
Dermatoses due to food and inhalant sensitivity	6	2	4	1	4	6	23
Dermatoses due to sensitivity to food, inhalants and fungi	3	4	5	..	8	24	44
Dermatoses due to fungus sensitivity	2	20	2	1	3	18	46
Dermatoses due to contact and fungi	1	1	1	..	..	..	3
Dermatoses due to contact	1	1	1	..	..	..	3
Undiagnosed	4	6	2	1	10	13	36
Total							155

The series is too small to be of any significance except to show the variation in location and the preponderance of fungus sensitivity dermatoses on hands and feet.

Table 5

DISTRIBUTION OF PATIENTS WITH DERMATOSES IN DIFFERENT AGE GROUPS

	1-10 Years	10-20 Years	20-30 Years	30-40 Years	40-50 Years	50-60 Years	60-70 Years	70+ Years	Total
Patients with dermatoses due to fungi	..	....	18	13	8	5	1	1	46
Patients with dermatoses due to fungi, foods and inhalants	2	2	11	12	7	7	3	—	44
Patients with dermatoses due to fungi and contact, and to contact	..	....	3	....	3	—	—	—	6
Patients with dermatoses due to foods and to inhalants	3	8	3	4	4	1	—	—	23
Patients with dermatoses undiagnosed	3	—	8	11	6	4	3	1	36
Total	8	10	43	40	28	17	7	2	155

suggestive of other allergy, the patients were then tested to approximately 150 common foods, inhalants and pollens. In some instances the intradermal tests were preceded by scratch tests. Patch tests with soaps, dyes, pollen oils and other suggested substances were employed when indicated.

Treatment in this paper is indicated only as to kind and no attempt is made to discuss it in detail. It is discussed here only because it is an important means of diagnosis. The therapeutic result is usually the final test of the etiology of any allergic skin condition. The lesions must be made better or worse by application or removal of the suspected cause or by injections and desensitization. Often complete etiology can be accurately determined only after the final resolution of the skin eruption.

In each case the patient was given the specific treatment indicated by the results of our diagnostic study. If tests with the fungus extracts were judged positive; that is, if they had produced alteration in the skin lesions coincident with a local reaction, the patient was always given injections with these extracts. Trial diets of foods giving negative skin tests, the avoidance of inhalants which gave positive skin tests, specific treatments for inhalants which could not be avoided (especially dust, orris, feathers, wools and animal hairs) were employed.

In a few of the earlier cases a period of trial diet and combined allergic treatment was tried for varying periods before injections with the dermatomycins were begun. After the first few cases, however, it was decided that this was a waste of time. The lesions seldom improved materially and the patients became discouraged and were often lost before improvement could be obtained. In this connection it is noteworthy that there were nine instances of dermatoses in individuals under specific treatment for hay fever and asthma. The skin lesions in these patients had not been influenced by this treatment and remained unchanged until injections with the dermatomycins were begun.

Treatments with the dermatomycins were given intradermally, beginning with that amount which produced a moderate local skin reaction at the site of injection and increasing gradually in amount as this local reaction decreased. If the local skin reaction increased in severity, as frequently occurred, the amount of extract injected was decreased at each treatment dose until a moderate reaction was again secured and treatments could be held constant or slowly raised.

RESULTS

An analysis of the results of this study is presented in Tables 1 to 7.

Table 6

THE INCIDENCE OF OTHER ALLERGIC MANIFESTATIONS (PRESENT OR PAST) IN PATIENTS WITH DERMATOSES

	Positive Family or Personal History of Allergy, or Both	Negative Family and Personal History of Allergy	Total Number
Patients with dermatoses due to fungi alone	26	20	46
Patients with dermatoses due to fungi, foods and inhalants	34	10	44
Patients with dermatoses due to fungi and contact	0	3	3
Patients with dermatoses due to foods and inhalants	19	4	23

Patients with dermatoses due to fungi alone show a considerably smaller incidence of other allergic manifestations than those in which fungus sensitivity is combined with other atopic. Patients with atopic dermatoses show a high incidence of other allergic manifestations.

Table 7

TREATMENT RESULTS

	Total	Cured	Improved	Unimproved	Undetermined
Patients with dermatoses due solely to fungi treated with fungus extracts alone	46	31 (67.3%)	9 (29.5%)	3 (6.5%)	3 (6.5%)
Patients with dermatoses due partly to fungus sensitivity	47	18 (38.2%)	22 (46.8%)	7 (14.8%)	
Patients with allergic dermatoses due to causes other than fungi	23	10 (43.4%)	13 (56.5%)		

Of 46 patients with dermatoses due to fungi alone, there were 31 cured, 9 improved, 3 unimproved. Treatment consisted only in desensitization with fungus extracts.

Of 47 patients with dermatoses involving fungus sensitivity, there were 18 cured, 22 improved, 7 unimproved. Treatment in each case consisted of desensitization with fungus extracts plus a strict allergen-exclusion regime.

Of 23 patients with dermatoses due to food and inhalant allergens, there were 10 cured, 13 improved.

As is indicated in Table 1, 155 patients were studied. Of these, 119 were diagnosed as to cause. Fungus sensitivity was involved in 93. In 46 patients fungus sensitivity was found to be the sole cause of the dermatosis. Of the remainder, 3 were found to be instances of contact eczema and 23 were atopic dermatoses due to foods, inhalants, or both.

In Table 2 is presented a more detailed analysis of the latter group.

In Table 3 it is seen that the majority of the dermatoses studied were classified as severe (76); of the remainder 59 were designated moderately severe and 20 mild.

Table 4 indicates the variation in location of the dermatoses. The preponderance of fungus sensitivity dermatosis on the hands and feet will be noted, but it is clear that location of lesions is not an infallible diagnostic criterion.

Table 5 indicates the distribution of the material studied throughout the different age groups.

In Table 6 is indicated the incidence of other allergic manifestations in patients with dermatoses. It is apparent that in patients with dermatoses due solely to fungus sensitivity there is a considerably smaller incidence of other allergic manifestations than occurs when the dermatosis is due to fungus sensitivity plus sensitivity to other allergens. Conversely, patients with dermatoses due to food and inhalant sensitivity show a high incidence of other allergic manifestations.

The results of treatment are given in Table 7. The tabulation indicates that, when an accurate etiological diagnosis is made, excellent therapeutic results may be obtained.

CONCLUSIONS

(1) Fungus sensitivity alone is a frequent cause of allergic dermatosis.

(2) Fungus sensitivity is frequently combined with sensitivity to foods and inhalants to cause an allergic dermatosis.

(3) The distribution of the lesions does not constitute an invariably reliable criterion as to the cause of allergic dermatoses.

(4) A positive skin test to the fungus extracts, trichophytin and oidiomycin, together with an alteration of the dermatosis coincident with the height of the local skin reaction at the site of injection, constitutes an accurate method of diagnosis of fungus sensitivity dermatosis.

(5) An accurate etiological diagnosis of allergic dermatosis followed by specific treatment is attended by satisfactory therapeutic results.

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INTRAVENOUS TESTING IN POST-ARSPHENAMINE DERMATITIS*

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The physician who treats syphilis faces few problems more disturbing or more serious than that of post-arsphenamine exfoliative dermatitis. It is generally agreed that this reaction is a manifestation of sensitization to the drug, and that frequently this hypersensitivity to any member of the arsphenamine group, and sometimes to all of them, is permanent, precluding their further use of these drugs. On the other hand, there are instances of post-arsphenamine exfoliative dermatitis which apparently do not fit into this picture, because further arsphenamine may subsequently be given without recurrence of dermatitis or any other serious reaction. In some patients who have reacted with vesicular or exfoliative post-arsphenamine dermatitis, it is probable that desensitization occasionally occurs. The phenomenon of spontaneous desensitization must be relatively rare, however, since in many of our patients, lapse of time was not sufficient to bring about desensitization, and hypersusceptibility to any and all arsphenamines has persisted from two to nineteen years.† Finally, the reaction may be drug specific rather than group specific; that is, a patient who is sensitive to one arsphenamine product is able to tolerate another.

In certain types of active syphilis, especially early syphilis or syphilis associated with pregnancy, resumption of treatment with one of the arsphenamines after post-arsphenamine dermatitis is more or less imperative. For many years various workers have been seeking a means of detecting whether or not the patient was still in a state of sensitivity, and whether arsphenamine therapy could be safely resumed. In 1923 we began experiments with the intradermal test. Finding the test of little worth, we discontinued employing it until 1928, at which time we resumed our investigation on 35 patients who had had post-arsphenamine dermatitis and on 116 controls. Our results,[1] later confirmed by Cannon,[2] showed that the intradermal test was of no practical value and could not be employed as a means of detecting the presence or absence of sensitization. In 1932, Schoch[3] [3a] used the patch test in a study of eight patients with post-arsphenamine dermatitis, and concluded that:

"The patch test with neoarsphenamine may be relied upon to permit, if negative, or to interdict if positive, further arsphenamine therapy, in patients who have recovered from arsphenamine dermatitis."

Since this conclusion was contrary to some earlier experiences of our own, we undertook a further study of the subject and patch tested 165 individuals, of whom 69 had had an attack of post-arsphenamine dermatitis. Our results[4] indicated that, while a negative patch test did not rule out the existance of arsphenamine sensitization, a strongly positive patch test in those patients who have recovered from post-arsphenamine dermatitis established its presence, and was a conclusive contraindication to further arsphenamine therapy.

In order further to determine the practical value of the patch test, we attempted to verify our results by administering the arsphenamines in small doses to those patients whose patch tests had either been negative or positive. In patients with strongly positive patch tests, minute doses of any of the arsphenamines invariably caused a recurrence of the dermatitis. Since similar recurrences also occurred in patients with negative patch tests, however, it became obvious that the patch test was relatively unreliable, and a new and more accurate method of determining arsphenamine sensitization had to be developed.

To this end we have continued our investigation and present this report on the value of intravenous testing as controlled by the patch test. We shall show that intravenous testing, if cautiously and carefully done, and after discarding all patients with a strongly positive patch test, is safe and practical, certainly much more so than uncontrolled reliance on the results of the intradermal or patch tests.[5]

MATERIAL FOR THIS STUDY

By means of the intravenous test,[6] we have investigated 110 patients who had had post-arsphenamine dermatitis of the exfoliative and vesicular types, with a view to determining whether permanent arsphenamine sensitization existed or persisted, and whether further thera-

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*From the Syphilis Division of the Medical Clinic of the Johns Hopkins Hospital.

†In one of our patients who has retained her sensitivity to arsphenamine for nineteen years, the intradermal injection of 0.1 c. c. of 1-2000 arsphenamine solution (0.00005 gm.) caused a mild generalized dermatitis.

peutic doses of arsphenamine could be given. Of these patients, 44 had been patch tested, 11 of whom responded with a positive and 33 with a negative test. Although 41 of the whole group were intravenously tested but once, and 26 and 17 twice and three times, respectively, 23 of our cases were tested by the intravenous method from four to ten times, the reason for which will be noted subsequently. In this group of cases three patients had had eruptions of the fixed dermatitis type and in one of these repeated intravenous testing caused a mild generalized erythemato-squamous eruption, which was easily controlled.

Table 1

COMPARISON OF PATCH AND INTRAVENOUS TESTS FOR ARSPHENAMINE SENSITIVITY

Patch Test		Intravenous Test	
		Negative	Positive
Positive	8	1	7
Negative	33	12	21

METHOD OF INTRAVENOUS TESTING

The procedure used is as follows: first, three months is required to elapse from the date of the complete healing or involution of the post-arsphenamine dermatitis. Second, a patch test is performed, using the drug which caused the dermatitis and often another of the arsphenamines as well. If a strongly positive reaction results with vesicular dermatitis at the site of the test, investigation of this patient ends at that point, as will be hereafter discussed. Third, intravenous testing is carried out in those patients who show negative or only partially positive patch tests, but, as a rule, a different member of the arsphenamine group from the one causing the original dermatitis is selected for intravenous administration. For instance, if arsphenamine caused the dermatitis, then neoarsphenamine is selected for trial, and if neoarsphenamine caused the skin reaction, then silver arsphenamine or another arsenical is resorted to. Fourth, advantage is taken of the fact that in sensitized patients the extent and severity of post-arsphenamine dermatitis is roughly proportional to the size of the dose administered; and in a sensitive patient, if the dose is kept small enough, the reaction obtained will consist only of generalized itching, or of a very mild erythematous or maculo-papular rash with or without scaling and chiefly limited to the flexures. Thus, for intravenous testing, the initial dose of arsphenamine, neoarsphenamine or silver arsphenamine is 0.025 gram, of mapharsen 0.005 gram. This dose is injected intravenously and if appreciable itching, with or without erythema, occurs, the tests go no further. If there is no skin reaction, subjectively or objectively, the injections are continued at weekly intervals, increasing the dose by doubling, or by even smaller increments, until an average therapeutic dose is attained. For instance, if neoarsphenamine is to be tested as the drug of choice for resumption of treatment, we administer intravenously 0.020 or 0.025 gram. The second injection, if no reaction occurs, is .050 gram, the third 0.1 gram, and so on. In only one patient did this procedure cause more than a mild erythematous eruption and that patient recovered very quickly. It must be emphasized that this test should never be speeded up, as real accidents may occur.

RESULTS OF THE STUDY

Of six patients with definitely positive patch tests, the minimal intravenous testing dose caused moderate itching and mild dermatitis in all. This was considered sufficient to contraindicate further attempts at arsphenamine therapy. Of two patients with suggestively positive patch tests, one began to itch immediately after the test intravenous injection, and the next day presented a mild dermatitis, while the other patient did not react at all on intravenous testing and thereafter, by slow degrees, was finally able to take routine treatment with one of the arsphenamines to the completion of his course.

Special interest centered in the group of 33 patients with dermatitis who presented negative patch tests. On receiving the minimum intravenous testing dose, twelve of these were also negative to the intravenous test and eventually could resume routine therapy. The remaining 21 reacted with a mild dermatitis on receiving the intravenous injection of the minimal dose. Of these latter 21, two were intravenously tested twice and two three times; all four reacted each time with a mild dermatitis, although each patient was patch tested before each intravenous test, and in each case the patch test was negative.

Sixty-six patients of the post-arsphenamine dermatitis group who had not been patch tested were also investigated with the intravenous test. Of these, 34 developed no untoward symptoms, and with gradual increase of the amount of drug injected were able at last to tolerate routine

treatment. Twenty-nine reacted with moderate to marked itching or mild dermatitis and temporarily, at least, further therapeutic attempts were discontinued. Three had had previous reactions of the fixed dermatitis type, and of these one developed a generalized mild dermatitis on repeated intravenous testing. As noted above, many patients were tested with the intravenous test more than once, several six times, one as many as ten times. Such multiple tests were employed because 11 patients who gave a positive intravenous test at first, later did not react at all and eventually could resume routine treatment with the arsenicals. This phenomenon may possibly represent progressive desensitization.

Table 2

THE VALUE OF INTRAVENOUS TESTING IN PERMITTING THE RESUMPTION OF FURTHER ARSPHENAMINE THERAPY

(Patients not Patch Tested)

Result of Intravenous Test

Total patients tested	66
Negative: arsphenamine treatment could be resumed	*36
Positive: patient definitely sensitized	†22
Mildly positive at first, later negative; possible desensitization	11

*Two with previous fixed dermatitis.

†One with previous fixed dermatitis.

SUMMARY

This report is presented to show that skin tests, whether scratch, patch or intradermal, for the purpose of detecting persisting sensitization to the arsphenamine following post-arsphenamine dermatitis, have been unsatisfactory, and that other means are necessary to determine whether antisyphilitic treatment may be resumed without the danger of recurring dermatitis. It is occasionally imperative that such treatment, interrupted because of post-arsphenamine dermatitis, be resumed, and all practical and reliable tests at our disposal should be utilized to determine whether this resumption is safe to the patient.

CONCLUSIONS

(1) A strongly positive patch test (with papules, vesicles and edema) in a patient with a history of post-arsphenamine dermatitis, is a contraindication to further treatment.

(2) Patients with less strongly positive patch tests may be intravenously tested with the possibility of a negative result in the latter test.

(3) In patients with negative patch tests, treatments should not be resumed without further investigation. The best method of determining the presence of arsphenamine sensitization is intravenous testing. In 63.6 per cent of our negative patch tested cases the intravenous injection of 0.020 gram of one of the arsphenamines produced a mild but conclusive dermatitis.

(4) When deemed necessary, more than one test (both patch and intravenous) should be performed in those patients in whom further therapy is desirable. A lapse of three months after the post-arsphenamine dermatitis should be permitted before intravenous testing is attempted.

(5) In 11 of our patients who were positive to intravenous tests one or more times, later tests were negative, and routine treatment with the arsphenamines could be resumed.

(6) A safe method of intravenous testing for arsphenamine sensitization is described.

(7) Patients with previous post-arsphenamine dermatitis, in whom repeated cautious intravenous testing fails to show evidences of the sensitization, may ultimately receive therapeutic doses of the arsphenamines with safety.

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DISCUSSION (*Abstract*)

Dr. Everett C. Fox, Dallas, Tex.—Dr. Robinson presents a valuable contribution for the testing of patients with post-arsphenamine dermatitis to determine their tolerance for further arsphenamine therapy. Any method which will help select those patients who may receive further treatment is of great aid to the syphilologist.

Arsphenamine dermatitis is in a large degree a preventable disease and when seen early responds fairly satisfactorily to treatment but occasionally it is an explosive and unavoidable occurrence.

In 1932 Schoch reported on the use of the patch test and drew two conclusions, one that patients with a positive patch test would not tolerate further arsphenamine, and this is still largely true, although Dr. Robinson has demonstrated that a few patients will receive further treatment without reaction. Second, he stated that patients with a negative patch test would tolerate

further arsphenamine. We know this is now true in approximately only 50 per cent of cases. In 1934 in a second paper Schoch indicated his change of opinion in this regard. At this same time he reported the results of the intradermal injection of 0.2 c. c. of 1 per cent solution of arsphenamine in an attempt to sensitize patients. In 186 cases receiving the intradermal injection none developed arsphenamine dermatitis, while in a like number of control cases not receiving the injection one developed dermatitis and two were stopped because of suspected impending dermatitis.

Dr. Robinson's observations have demonstrated that an occasional patient with a strongly positive patch test will tolerate further arsphenamine but, still more important, that approximately one-third of those with a negative patch test will receive further arsphenamine without reaction. In cases not patch tested 36 of a total of 66 received further treatment without reactions.

Further work in this field should be encouraged so that we can eventually select 100 per cent of those patients who would tolerate further treatment.

Dr. Howard Hailey, Atlanta, Ga.—It has been my observation that the cases of arsphenamine dermatitis which necessitated attention were the result of further administration of the drug after the patient had noted some itching.

I have never had a case of arsphenamine dermatitis which developed in a patient who was under my care. In the cases which I have seen the patient invariably stated that he had received subsequent treatment after itching had been noticed. If itching is reported since the last treatment, even though there be no visible lesions, arsphenamine should be discontinued. I have had several patients who reported itching; bismuth therapy was then substituted. After the course of bismuth injections, arsphenamine was resumed without any further trouble.

THE FAVORABLE INFLUENCE OF ADEQUATE (HIGHER) CARBOHYDRATE DIETS ON THE BLOOD PRESSURE OF DIABETIC PATIENTS*

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It has been the author's privilege to work through what might be termed the entire modern period, from 1913 to 1935, during which time much has been learned about the treatment of diabetes mellitus.

In 1913 the annual mortality rate among diabetics was 28 per 100 (Joslin).[1] Realization that coma was precipitated by the unlimited fat content of the older diets led to a restriction in the amount of fat used. This restriction plus a reduction of the protein content of the diet led by 1919 (Joslin[1]) to a death rate of only 4 per 100 per year. The culminating study of this pre-insulin period was reported in Woodyatt's[2] paper entitled "Objects and Method of Diet Adjustment in Diabetes" (1921), in which he stated that if the glucose-fatty-acid ratio of the diet did not exceed 1:1.5, or, in other words, if the total grams of fat in the diet did not exceed twice those of the carbohydrate plus one-half those of protein, ketosis could be prevented. He used a normal amount of protein, and his diets contained more carbohydrate and less fat than any prescribed up to that time.

In 1922, Banting and Best[3] announced the discovery of insulin, and by 1923 an adequate supply of this hormone was available for all who needed it, at a reasonable price. We expected that the Woodyatt diet plan, supplemented by a sufficient amount of insulin, would solve the treatment of diabetes. We used his diet plan together with adequate quantities of insulin in a large number of severe diabetic patients of all ages.

By the fall of 1924 we were disappointed because the patients had not always been freed from ketosis, and because they had not been restored to a state of robust health. Many adults, in spite of a diet containing an adequate number of calories, exhibited an abnormal elevation of their blood pressure; and arteriosclerosis was appearing prematurely in children. Some doubt was thrown on the value of insulin, because of what use was it to save a child from dying of diabetes only to let it succumb at an early age to arteriosclerosis: The diets used in that day consisted of bran bread, meat, eggs, a limited amount of lower percentage vegetables, and enough fat to make up the required number of calories. They contained practically no fruit, none of the higher carbohydrate vegetables, and but little milk because of its milk sugar content. These diets were deficient in the "protective" vitamin-containing foods, high in the acid-ash-containing foods, and still contained what today would be considered large amounts of fat.

Our first patient to receive a high carbohydrate, low fat diet was a man 51 years of age, who, on a diet of 2,535 calories consisting of 80 grams of carbohydrate, 88 grams of protein and 207 grams of fat with no insulin, was not enjoying robust health. He had no obvious complications aside from the presence of occasional hyaline casts in the urine. On December 26,

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1924, we gave him a diet containing 2,505 calories made up of 278 grams of carbohydrate, 85 grams of protein, and 117 grams of fat. Within 24 hours he noticed a change, and eight days later he felt so much better that he left the hospital and returned to work. We found that on this diet 112 units of insulin were required to keep his urine sugar-free and his blood sugar normal. By August 16, 1925 (8 months after beginning the experiment), on the same diet, he had been able to reduce the insulin dosage to 35 units per day.

We had expected to give this patient much larger doses of insulin, basing our estimate on the Woodyatt diet ratio of one unit of insulin per gram of sugar-formers in the diet. We eventually found that when iso-caloric diets were used, 100 to 150 grams of carbohydrate could be substituted for 100 grams of fat without a change in the insulin dosage. The amount of carbohydrate which one unit of insulin will metabolize varies considerably. In general, it is between 1 and 2 grams, but may reach as high as 6 grams. My own and others' work has shown that the higher the carbohydrate content of the diet the more effective insulin is in the metabolism of carbohydrate.

In January, 1926, we[4] published the results obtained in the treatment of 150 patients according to this plan. The diets contained an adequate amount of protein and two grams or more of carbohydrate for each gram of fat. We erroneously called these "high carbohydrate diets." They were high in carbohydrate as compared with the former diets used, but a better term would have been "adequate carbohydrate diets." This experiment demonstrated that diabetic patients could be easily controlled on high carbohydrate diets. All patients had been restored to more nearly normal states of physical and mental activity. The diets had proven to be more palatable than the former ones. The patients had lost their craving for forbidden foods, especially the carbohydrates. A somewhat lower caloric intake had apparently sufficed to maintain body weight constant. The diets were less expensive because they contained no special foods and a smaller amount of the expensive fats, such as cream, butter, and olive oil.

Independently, Geyelin[5] (1926) also found higher carbohydrate diets both favorable and beneficial. The major portion of his work, however, was done on children. Adlersberg and Porges[6] (1927) came to similar conclusions, although they used diets containing more protein than ours.

An analysis of our first thousand cases[7] treated by this method showed no clinical evidence of arteriosclerosis in any of the children, some of whom had been on this diet for eight years. In adults the incidence of arteriosclerosis was proportional to the age of the individual rather than to the duration of the diabetes. Recently two patients who had been under treatment for six and twelve years, respectively, died in the hospital and their blood vessels were examined. The first case was a boy 19 years old, who had been treated for six years, and the second was a woman 60 years old, who had been treated for twelve years. The boy showed no evidence of arteriosclerosis at autopsy, while the woman showed a minimum amount for her age. In view of the pessimistic outlook of Shields Warren,[8] who in 1930 stated that he had yet to see an autopsy on a diabetic of five years' standing without finding arteriosclerosis, these autopsies were encouraging.

A striking feature of the second case was the smooth, glistening appearance of the aorta and the absence of brittle vessels in the periphery in a woman in the arteriosclerotic age group with long standing diabetes.

In 200 consecutive deaths among diabetic patients treated with adequate carbohydrate diets, arteriosclerosis has been responsible for 42 per cent. The average age of the arteriosclerotic group has been 63 years.

The continued use of these diets has effected a gradual reduction in the average insulin dosage of the patients. At present our patients who take insulin average about 40 units daily.

These diets have accomplished the objectives planned for them, namely: (1) they are possible and practical; (2) they keep the patients free from ketosis, except under unusual circumstances, infection being the most common exception; (3) the patients are restored to an excellent state of health; and (4) the appearance of premature arteriosclerosis is being prevented in children.

Why these diets have had a beneficial effect on the blood vessel picture is not clear. Most adults with diabetes, if seen in the early stages of the disease, are overweight. The mechanical hypothesis that increased body weight increases the total extent of the vascular system may explain the hypertension as a compensatory measure to maintain adequate circulation. It is also

probable that the fats which cause the overweight may injure the blood vessels, as will be discussed later.

For many years we have conducted clinical and animal experiments in the hope of unraveling some factors in the hypertensive cardiovascular disease picture. In 1923 we[9] believed that we had produced arteriosclerosis in laboratory animals (rabbits) by feeding them diets comparable to those fed to human diabetic patients. These diets consisted of 20 per cent cooked dried liver, 20 per cent casein, 20 per cent maize, 30 per cent wheat, 1.5 per cent navy beans, 2 per cent cod liver oil, 1.5 per cent calcium carbonate, and 1 per cent salt. This diet produces an acid-reacting urine. Control animals fed predominantly on alfalfa hay, which produces an alkaline urine, failed to show arteriosclerotic changes.

We then believed that the high protein, acid-ash content of these experimental diets was responsible for the arteriosclerosis. Subsequent work done by us and others, however, has convinced us that the cholesterol content of the cod liver oil and liver was the responsible factor.

In another experiment we[10] attempted to produce diabetes and arteriosclerosis by feeding a carbohydrate-free, high fat diet. The experimental diet consisted of 32 per cent casein and 62 per cent "crisco," with the Osborn and Mendel salt mixture. The animals were given in addition 5 minims of cod liver oil, 0.4 gram dry powdered yeast, and 2 drops of wheat germ oil daily. This diet failed to produce either arteriosclerosis or diabetes in those animals whose urine was kept acid by ammonium chloride, or in those kept alkaline with sodium carbonate. Since the "crisco" which we used as a source of fat contains practically no cholesterol, a high fat, low cholesterol diet alone apparently does not produce arterisclerosis in rats.

Not only did these animal experiments fail to substantiate the hypothesis that the acidity or alkalinity of the urine was a significant factor in the etiology of arteriosclerosis, but we have been unable to find any evidence of a significant change in the plasma pH of human patients by dietary measures.[12] This leads us to believe that the reaction of the urine is secondary and compensatory rather than primary in arteriosclerotic subjects.

Schönheimer (1924-1929),[13] and Yuása (1928)[14] have both shown that changes in the intima of the aorta and other vessels, which are indistinguishable from lesions observed in human arteriosclerosis, may be produced in both herbivorous and carnivorous animals by the addition of cholesterol to diets which are otherwise adequate. Anitschkow[15] (1924) fed rabbits only a few milligrams of cholesterol as milk over a period of thirty months and produced marked sclerosis.

Recently Rabinowitch[16] has shown statistically that it was probably the high cholesterol content of the older type of diabetic diet which was responsible for the arteriosclerosis. Leary[17] (1935) has maintained that in non-diabetic patients cholesterol is responsible for what he calls atherosclerosis. He maintains that the overeating of such necessary, but cholesterol-containing foods as milk and eggs is responsible for this condition.

We should like to reduce the fat content of our diabetic diets further. Palatable diets can be planned with no more than 55 grams of total fat. This was the fat content of the Voit diets of fifty years ago. Such diets might be even more beneficial than those used now. We have experimented with diets containing 4 and 6 grams of carbohydrate per gram of fat. As a rule they are useful, but occasionally difficulty in adjusting insulin dosage is encountered.

Insulin has been so highly purified that the effectiveness of a single dose does not seem to last more than about five hours, whereas formerly it lasted eight hours or more. Formerly most patients could be maintained with a constantly sugar-free urine and with a normal blood sugar on two doses of insulin per day. Now it is usually necessary to give three and occasionally four doses per day. It is often necessary in children to give a midnight or a 2:00 a. m. dose in order to obtain a normal blood sugar before breakfast. We hope that by some chemical modification of insulin it will be possible to prolong the effectiveness of a single dose, so that patients may be maintained with a urine constantly sugar-free, and without symptoms of hypoglycemia on fewer doses. When this can be accomplished, we shall probably be able to use still higher carbohydrate and less fat-containing diets than we are now using, thus eliminating all unnecessary cholesterol from the diets.

CONCLUSIONS

(1) More nearly normal diets are possible and practical for diabetic patients. They seem to have a favorable influence on the blood vessel picture in both children and adults.

(2) There seems to be no causative relationship between the acid-base balance and the incidence of arteriosclerosis of animals.

(3) It is probable that the high cholesterol content of the older diabetic diets was responsible for the arteriosclerosis seen.

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SOME OBSERVATIONS ON THE ANEMIA OF PREGNANCY*

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There is still considerable difference of opinion concerning the clinical significance of the mild, simple anemia encountered frequently among pregnant women. The apparent changes simulate those characteristic of hypochromic, microcytic anemia, which is commonly considered a deficiency disease, and which is generally admitted to be the most frequent of the true anemias of pregnancy.

The diagnosis of hypochromic anemia ordinarily depends upon routine clinical red cell counts and hemoglobin determinations. During pregnancy, such methods alone are unreliable because critical laboratory investigations lead to the conclusion that hemoglobin deficiency is often more apparent than real and may be dependent upon physiologic alterations of blood volume and concentration. Therefore, it is unwise to diagnose hypochromic anemia of pregnancy unless repeated determinations show the red cell count to be below 3,500,000 and the hemoglobin to be under 70 per cent.

Evidence will be adduced to show that any less marked reduction may certainly be explained on physiologic grounds and that there is no good reason to believe that treatment of such minor physiologic changes will produce beneficial results. It is essential that the physiologic factors underlying the changes occurring during pregnancy be understood before hazarding a diagnosis and instituting treatment for a condition which may be physiologic rather than pathologic. The various factors which tend to produce anemia in pregnancy or which compensate for this tendency will be reviewed, and certain new data will be presented.

FACTORS FAVORING THE DEVELOPMENT OF HYPOCHROMIC ANEMIA IN PREGNANCY

Inadequate Diet.—A diet which is adequate in the non-pregnant state may become quite insufficient as fetal demands increase. This risk is obviously greater in connection with those food factors which are ordinarily ingested in minute quantities, such as iron. This naturally increased risk of dietary inadequacy is further enhanced by the capricious appetite and the digestive disturbances, nausea and vomiting, which interfere with the ingestion of proper amounts of nourishment during the early months. The frequent tendency to provide additional caloric intake with chemically pure food stuffs, such as dextrose, completely ignores mineral and vitamin requirements.

Defective Utilization.—There is a decided tendency, especially in the early part of gestation, toward gastric anacidity or hypo-acidity which admittedly interferes with the proper utilization of ingested iron, either directly or indirectly through the medium of a separate and little known "gastric factor," which may be extremely important.

Fetal Demand for Elements Necessary for Blood Formation.—Fetal blood and its essential hemoglobin are formed *in situ* from materials transported across the placental barrier from the maternal circulation, a transfer which inevitably constitutes a drain on the iron resources of the mother. The parasitic activity of the fetus enables it to obtain its full complement of iron even though the mother may be seriously anemic. Because of the peculiarities of antenatal

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circulation fetal blood must contain a greater hemoglobin concentration than is necessary in the adult, if oxygen deficiency is to be avoided. The blood coming from the left heart is partly venous and consequently has a low oxygen saturation, even though fetal metabolism demands more oxygen per unit of weight. The average hematocrit of fetal blood is 52 per cent as against 40 per cent for the maternal blood at the time of birth, and there is a correspondingly high hemoglobin content: 16.50 grams per 100 c. c. as against 13.75 grams in the mother's blood. That this plethora satisfies needs peculiar to antenatal conditions is indicated by the rapidity with which it disappears after birth, when pulmonary respiration has been established.

Fetal Iron Storage.—It is also established that the fetus develops reserve stores of iron, especially in the liver, for use during the early months of independent existence when milk, an iron-poor food, constitutes the only source of nourishment. The liver of the human new born contains approximately three times as much iron per unit of weight as does the adult organ. This iron storage is largely a phenomenon of the last trimester of pregnancy, a fact which explains the frequent appearance of anemia in premature children who are born before this reserve is established.

The full-term human new born contains 350 to 400 milligrams of iron, whereas a six months fetus has only one-third this quantity, or 120 to 135 milligrams. During the first six months of intra-uterine life the fetal demand amounts to approximately two-thirds of a milligram of iron per day, while in the last three months the daily increment averages nearly three milligrams, and is even higher as term is approached. The drain on the maternal stores is thus at least four to five times as great in the last trimester of pregnancy as in the middle period when fetal blood formation first becomes significant. The fetal circulatory system is formed and begins to function during the fourth week after conception, but even at the end of the first trimester of pregnancy, when the fetus weighs only 15 grams, the entire amount of blood iron is almost negligible. Early iron storage is then largely a phenomenon of the middle three months when one-third of the iron is accumulated. The curve of iron retention by the fetus probably agrees with that determined for the other fetal materials and is roughly proportional to the fetal weight.

Maternal Demand for New Tissue Growth.—In addition to supplying the fetal demand, the mother is also under the necessity of providing iron for new tissues in her own body, particularly the breasts and uterus, the latter having a very high iron content. Coons has estimated that the average daily need for this purpose is one-half milligram for the entire period of pregnancy. The total daily average requirement is thus almost a milligram per day, a figure far beyond that of ordinary adult life.

COMPENSATORY FACTORS OPERATING TO PRESERVE IRON EQUILIBRIUM

It seems probable that certain compensatory phenomena are active to spare the iron normally fixed in the maternal tissues.

Natural Reserves.—It was suggested many years since that even at the time of puberty the female organism begins to build up iron reserves in anticipation of pregnancy, and that this storage may account for the occasional appearance of severe anemia (chlorosis) in adolescent girls. There is no proof for this contention, although the hypothesis is attractive.

Economical Iron Metabolism.—The iron balance determinations of Coons offer excellent evidence that the metabolism of this mineral during pregnancy is much more economical than usual, so that even on a limited intake storage is possible through reduced excretion. In certain of her subjects as much as one-third of the ingested iron was retained, and all of them maintained significant positive iron balances. During the first six months of pregnancy iron retention was generally considerably in excess of the fetal demands even when no attempt was made to augment the iron content of a good general diet. This early economy serves to protect the organism during the last three months when the fetal drain is especially great.

FACTORS SERVING TO CONFUSE THE PICTURE

During pregnancy there is a true hydremia resulting in considerable dilution of the blood, which has been demonstrated in several ways: by lowering of the specific gravity, by increase in the water content and decrease in the total solids, by diminished depression of the freezing point, and by reduction of the plasma protein percentage. This hydremia is significant since it is obvious that fluid added to the blood will dilute its fluid portion and thus increase the dispersion of the formed elements with which we are especially concerned. In 1924, it was

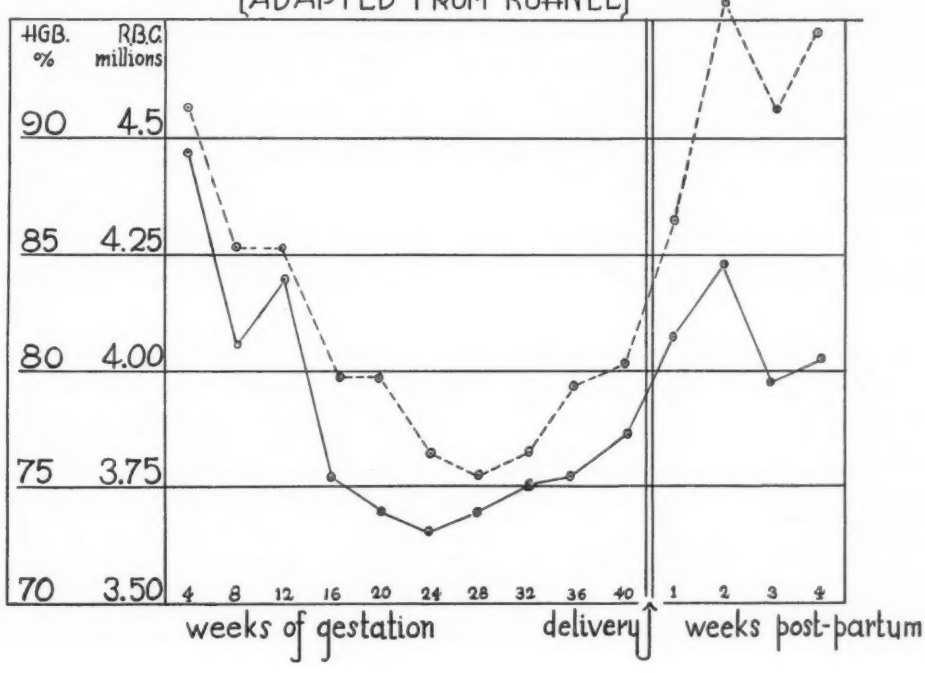
shown that the plasma proteins decrease during the early months of pregnancy to reach a low point in the second trimester and then increase as term is approached. Moreover, it was demonstrated that the volume of plasma in whole blood varies inversely with the plasma protein concentration. It was then argued that the curve of actual blood dilution probably follows closely that of the plasma proteins which by their physical nature cannot pass easily out of the circulatory system.

Several investigators, most recently Dieckmann, have determined the blood volume of pregnant women and generally agree that gestation is marked by an increase in the volume of circulating blood. Dieckmann found an increased blood volume with a reduced number of red cells as early as the beginning of the second trimester of pregnancy and reaching a maximum at term. His data on the nature of the curve which the blood volume follows are not conclusive and until better evidence is adduced it would seem reasonable to conclude that it follows generally that of the plasma proteins and hematocrit.

Although previous investigators had shown a consistent reduction in the red cells and hemoglobin per unit volume of blood during gestation, Kühnel, in 1926, first plotted these variations in the form of a curve. His results show a progressive fall in the quantity of red cells and hemoglobin from the first weeks of pregnancy to a minimum in the sixth to eighth lunar month and a gradual rise in the next two months, with a more rapid increase after delivery (*Chart 1*). The maximum drop amounts to 19 per cent of the erythrocytes and 18 per cent of the hemoglobin at the twenty-fourth to the twenty-eighth week, which compares well with Dieckmann's blood volume increase of 16 per cent at the thirtieth week. This latter investigator, however, postulated a continued increase in blood volume as term is approached, even though his data agree with Kühnel's in indicating an

RED CELL AND HEMOGLOBIN CONTENTS OF BLOOD DURING PREGNANCY AND THE PUERPERIUM

(ADAPTED FROM KÜHNEL)



increased hemoglobin concentration in the last months of pregnancy. Since Dieckmann's hematocrit values also show a rise near term corresponding with the hemoglobin increase, it is reasonable to ignore the apparent disparity between these readings and his blood volume figures.

OTHER PERTINENT DATA

During pregnancy there is normally no unusual blood loss and no evidence of abnormal blood destruction, while after delivery the blood picture returns rapidly to normal without medication and without evidence of rapid blood formation. The observed decrease in red cell and hemoglobin concentrations is at least compensated by the increased blood volume. Moreover, there are certain data which indicate that there is actually an increased rate of new blood cell and hemoglobin formation during gestation. Dieckmann has demonstrated increased color and hemoglobin indices. The red cells become slightly larger than normal and contain more hemoglobin. Our data confirm these observations by showing that in normal non-pregnant women the erythrocytes contain only 29.4 grams hemoglobin per 100 grams cells, whereas the corresponding value in women late in pregnancy is 30.6 grams.

If the fetal demand for iron actually produces an anemia, it should be of hypochromic type and should become more marked as the drain increases. It has been noted above that the color index tends to rise slightly, whereas in hypochromic anemia it should fall. Furthermore, Kühnel's data indicate that both the number of erythrocytes and the hemoglobin concentration rise as term is approached, and our work confirms this statement by showing parturitional values above the non-pregnant level. No doubt this phenomenon is due largely to concentration of the blood, but there is no evidence that this change is carried beyond the normal level.

NEW DATA BEARING UPON THE PROBLEM

Our recent work along these lines has involved determinations of hematocrit, specific gravity, water concentration, hemoglobin, and plasma protein on the blood of women late in pregnancy, during labor, and after delivery. We were concerned especially with the curious concentration of the blood which appears during parturition. Without describing the analytical methods employed, the data are shown in Table 1.

Cell volume determinations made on heparinized whole blood (heparin does not alter cell size) showed characteristically low readings in the last month of pregnancy with the early labor figure almost as high as that for the non-pregnant group and the value at delivery somewhat higher. The late-pregnancy figure (35 per cent) is undoubtedly considerably higher than that which would have obtained during the sixth or seventh lunar month, but is still below our normal (39.7 per cent). Early in labor the average hematocrit value was 39.3 per cent, while at delivery it had risen to 41.4 per cent. Presumably this parturitional blood concentration is related to the metabolic change first pointed out by Zangemeister as responsible for the usual pre-labor loss of weight.

Specific gravity variations generally follow closely the alterations in cell volume, indicating that the diluting fluid is largely water, the concentration of which in the whole blood and plasma varies with the specific gravity. The distribution of water between cells and plasma

Table 1

SPECIFIC GRAVITY, WATER CONCENTRATION, HEMOGLOBIN AND PLASMA PROTEIN IN THE BLOOD OF PREGNANT, PARTURIENT AND PUERPERAL WOMEN (AVERAGE VALUES)

Material	Cell Volume Per Cent	Specific Gravity		Water Concentration (Gr. per kg.)		Hemoglobin Gr. per 100 c. c.	Plasma Protein Gr. per 100 c. c.
		Plasma	Whole Blood	Plasma	Whole Blood		
Normal non-pregnant women	39.7	1.0181	1.0406	909	811	12.53	6.77
Late normal pregnancy (primigravidas)	36.1	1.0152	1.0363	914	826	11.93	5.89
Late normal pregnancy (multigravidas)	34.6	1.0155	1.0376	915	828	11.45	5.61
Early in labor	39.3	1.0168	1.0387	910	809	13.36	6.51
At delivery	41.4	1.0189	1.0425	906	798	14.10	6.77
Postpartum (7 to 9 days after delivery)	42.7	1.0186	1.0450	907	798	14.13	6.73

is quite constant, showing that fluid introduced into the plasma comes quickly into equilibrium with the cells.

In agreement with previous observations, the hemoglobin is somewhat lower than normal during the latter part of pregnancy, but rises to or above the non-pregnant level during labor and is at a similar high point during the second week after delivery. It is obvious that in late gestation the hemoglobin has not decreased in proportion to the blood dilution as shown by the specific gravity and the plasma protein values. The cell hemoglobin calculated from the whole blood and the cell volumes indicates a marked rise in the hemoglobin per unit weight of cells during pregnancy and a further increase during labor, with a fall after confinement. It would seem that these pregnancy changes represent an attempt to compensate for the blood dilution in an effort to preserve the proper function of the body which might otherwise suffer from too great oxygen deprivation.

In the toxemia of late pregnancy, the blood probably undergoes an increased dilution proportional to the extent of the edema, whereby the red cell and hemoglobin concentrations are reduced below the usual pregnancy level and the impression is gained that there is a more marked anemia. In the absence of evidence pointing toward blood loss or destruction, it is more reasonable to attribute these changes to increased blood dilution.

The plasma protein curve agrees in general with those for cell volume, specific gravity and hemoglobin, but is the reverse of that for water concentration. This evidence supports the conception that changes in blood volume are reflected in variations of the protein content, the total of which in the circulatory system is probably constant.

DISCUSSION

The data on blood volume, together with those on red cell and hemoglobin concentration, indicate that the so-called "physiologic anemia" of pregnancy is due to dilution of the blood incident to the marked increase in blood volume which probably has a protective function, as suggested by Dieckmann. The organism attempts to compensate for this dilution by creating new red cells and hemoglobin so that the total circulating quantity of each is increased, even though the quantity per unit volume rarely if ever reaches normal. This mechanism is probably associated with the ability of parturitional and puerperal women to withstand blood losses which would prove fatal to the non-pregnant, and certainly explains the rapidity with which they attain a normal blood picture after delivery in the absence of any specific anemia treatment. In the last months of pregnancy, when the fetal demand for iron is maximal, the hemoglobin per unit weight of cells is increased over the non-pregnant level and the hemoglobin per unit volume of blood is greater than during the middle of the pregnancy.

There is then no anemia in the sense of blood loss or blood destruction and in the normal individual for treatment. Those who have treated such patients with various iron and copper preparations from the middle trimester of pregnancy and have noted an increase in red cells and hemoglobin near term have not given consideration to the apparent improvement to be expected from the physiologic concentration of the blood occurring normally at this period.

It should also be emphasized that the errors inherent in the usual blood counts and hemoglobin determinations are so great as to make such results unreliable, and that even with well-controlled technic

> "the individual variations are so marked that it is evident that a diagnosis of anemia requires more than a hemoglobin or erythrocyte determination and that even with a complete hematologic examination in many cases the diagnosis will still be questionable" (Dieckmann).

The generalized hydration of the tissues in pregnant women, even in the absence of demonstrable edema, constitutes another probable source of error, since finger-prick blood, unless the puncture is so deep that pressure is not necessary to secure an adequate specimen, may be diluted with tissue fluid, making the readings lower than they should be and distorting the picture.

There is cumulative evidence that the incidence of hypochromic anemia is increasing generally and particularly as a concomitant of pregnancy due possibly to the effects of "depression diets," and that its recognition should be a part of reasonable prenatal care. The best protection is offered by a diet which contains adequate amounts of meat, eggs, and green vegetables. Coons' observations indicate that green vegetables cannot replace meat and eggs and offer another argument against the common but needless restrictions of protein foods during normal pregnancy and in the toxemias.

MEDICAL SUPERVISION OF SUMMER CAMPS*

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The open spaces universally call men to participate in play, study, and meditation. Outdoor life appeals to the boy and girl grown old as well as the young child and adolescent. The adult revels in past youthful experiences, while the young explore, improving physique and mind and feeling new emotions.

Camping experience is as old as man. With the centralization of the population and the development of such organizations as the Y. M. C. A., the Y. W. C. A. and Boy and Girl Scouts, camping evolved from a several days' outing with crude and unhygienic sanitation to one of several months' duration with permanent equipment and modern sanitation. Likewise from a share-expense program it has in many instances become an institution for profit.

There has also been an enormous increase in the number of camps. Sargent,[1] in 1900, listed only twenty-two camps. The White House Conference on Child Health and Protection states that there are now 7,367 organized children's camps in this country, with over 1,000,000 in attendance. The mean age of the campers is about twelve years, with many six years, and some even younger. This is sufficient justification for serious consideration by pediatricians.

The open country should be an ideal environment in the summer for children through adolescence. Supervised play, broadening of contacts, body building, opportunity for adventure, the weaning away from over-anxious parents, change of routine, learning competition and fair play with one's equals are a few of the selling points that appeal to family and physician. With the rapid growth of summer camps there has developed a responsibility for the care and supervision of this large number of children. Medical supervision has not reached the efficiency the problem warrants.

Sanders[2] made a study of 503 of the better organized camps distributed over the United States with a camp population of 128,798. In summing up his conclusion he said:

> "It would seem to be that life in camp is particularly conducive to the rather serious depletion of the energies of campers and to the consequent accumulation of fatigue. Furthermore, the program of a typical camp offers considerable evidence that this depletion does occur in the case of sleep and rest in many cases. If this is occurring to any large number of campers and in any large number of camps, then any philosophy of camping which makes abundant health one of its aims must deplore this situation."

Could not this explain Sanders' conclusion? Only 15 per cent of the camps had a physician in attendance, 24 per cent had a medical student, 30 per cent had a registered nurse, 27 per cent had a practical nurse, and 3 per cent had none of the above mentioned personnel. No doubt this cross section is typical of all the camps in the country; if so, over 850,000 children are dependent on medical students and nurses for their health supervision. As a bright side of his observations Sanders says:

> "The excellent health conditions in some camps give any needed proofs that life in camp may be exceedingly beneficial to campers. This statement is made lest some of the criticisms of specific conditions made in the report be interpreted as a criticism of camping as an institution."

My criticism of the results of camp life on my patients led a director of a boys' and girls' camp to ask me to help him correct conditions which he felt could be prevented by proper medical supervision. It was this preventive phase that appealed to me. There had to be an adjustment of my mental processes to the fact that I was dealing primarily with normal healthy boys and girls and that consequently the routine must not be so restricted as to simulate either a hospital or a convalescent home. Every safeguard must be thrown around them, yet they must be allowed every opportunity for adventure.

Medical supervision of camp involves no end of detail. The physical equipment has to be carefully inspected to see that it is adequate and hygienic. This includes the sleeping quarters, toilets, lighting, showers and foot solutions, kitchen, dining room, milk and water supply in camps and on hikes, aquatic equipment, stables and their sanitation, play grounds, work shop, drinking fountains, food, nurses, cooks, dietitians, infirmary, isolation quarters, and so on. The physical examination of cooks and all food handlers for any contagion includes culture of stools for typhoid. Drinking water and lake

*Read in Section on Pediatrics, Southern Medical Association, Twenty-Ninth Annual Meeting, St. Louis, Missouri, November 19-22, 1935.

water also require examination for pollution. Even the picking up of glass, nails, and the smoothing of paths are essentials. Many of these require daily supervision. Fortunately I have had as medical resident each year a pediatrician, who had a vision of preventive medicine.

From Sanders' survey it was possible to plan a campaign to prevent accidents. He believes if pathways are smooth, no glass or nails lying around, swimming areas cleaned and stairways and railings in good condition, 25 per cent of the accidents will be reduced. If poison ivy and small cuts were cared for, another 25 per cent reduction could be expected. If there is adequate education in the care of tools, horseback riding, and the wearing of proper shoes, an additional 14 per cent could be eliminated. Twelve per cent could not be prevented, but greater care and intelligence should prevent another 24 per cent. It was upon this basis that the campaign for the prevention of accidents was instituted. Every accident is considered preventable.

It can be readily comprehended that there will be intricate measures to be constantly watched and instituted to safeguard health and personality from the time before camp opens until the last child leaves, so I can only outline certain principles.

We shall assume first that the equipment is complete, that doctor, nurses, dietitians, cooks, and counsellors are all well and ready for the reception of campers. The medical certificate, which precedes the camper, states physical conditions, the immunizations completed, the contagious illnesses the camper has had, and recommendations from his physician. As soon as the camper arrives the medical officer takes his temperature and makes a physical examination or inspection to see that there is no evidence of infection or that no indisposition is present. The temperature is taken once a day for ten days to detect an early manifestation of an illness, especially a contagious disease. Daily inspection is made throughout camp. Any suspicious case is immediately sent to the infirmary and isolated until diagnosed.

The success of any prevention depends on education. This we found true in this camp. The first prerequisite to success is the selling of the idea to the counsellors, for the outcome rests on their cooperation. The recommendations of the medical department for the guidance of the counsellors must be gone into in detail, explaining why each suggestion is made, then they must be checked and encouraged. When a camper is hurt or becomes ill, a conference is held at once with the counsellor to see why it occurred and if it could have been prevented. A talk to the campers with rewards for cooperation gives most helpful assistance. A routine schedule must also be made out for doctor and nurse, especially the supervision of activity to prevent fatigue. Proper and adequate food and sufficient sleep are important adjuncts to the

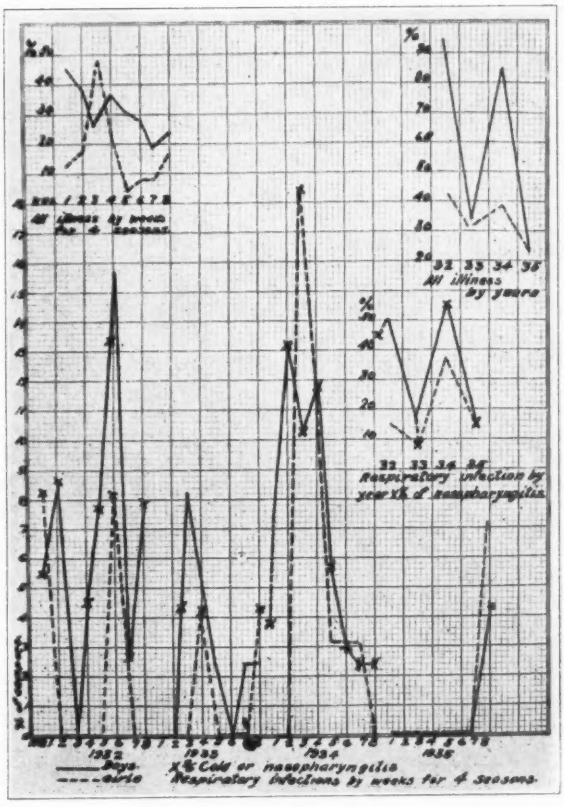

Chart 1

Per cent of all illness by weeks and by years. Per cent of respiratory infections by weeks and by years. X shows per cent of respiratory infections due to nasopharyngitis.

successful care of the campers. While competition is wholesome training, it must in no case be emphasized to the point of producing worry or disappointment.

Three factors especially must be paramount for the prevention of illness in camp, and must be held constantly in mind by all responsible for the campers, namely: fatigue, worry, and insufficient sleep. It is encumbent on the medical officer to watch for these three factors at all times. The physician must realize that his position is not at the infirmary to wait for accident or illness to be reported, but that he must mingle with campers and counsellors and is in supreme command of all activities where the health and happiness of the campers are involved. This is especially true at the swimming hour. Chilling must be prevented. It has been found that upper respiratory infections are apparently reduced if no swimming is permitted when the temperature of the air is lower than that of the water.

From the very first I was surprised to see the number of mental hygiene problems in camp. It is or should be in the province of every camp management to supervise and correct any emotional irregularities. The mental and physical development of the camper should proceed together, with the same consideration given to the one as to the other. The first attempt was to request of the parents a confidential letter giving any traits they deemed objectionable or would like corrected. Many did not reply, while others sent as much as a fifteen-page letter. It was found better to send a questionnaire which would give more uniform information. This could be studied and plans made to overcome any faulty mental hygiene.

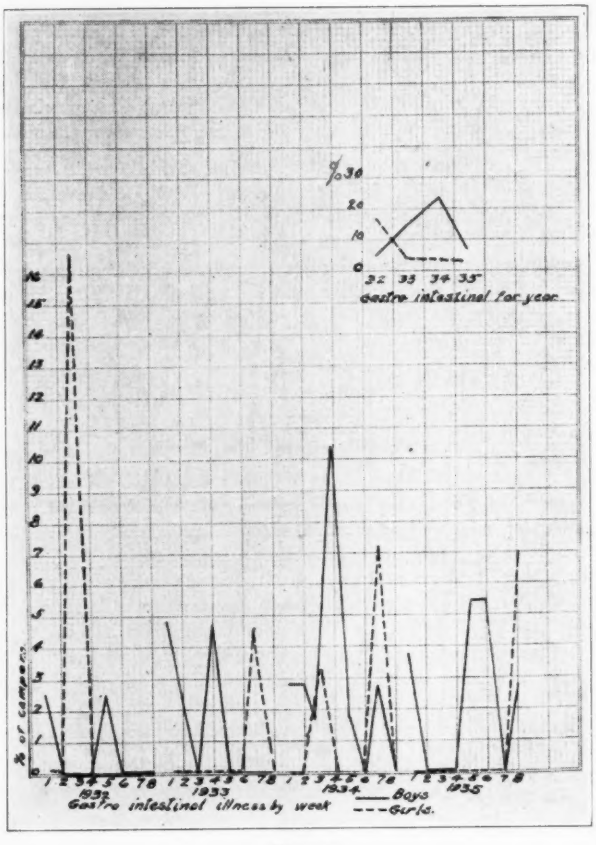

Chart 2
Per cent of gastro-intestinal illness by weeks and by years.

It was felt that the camp's full responsibility had not been fulfilled without a conference with the older campers and counsellors on sex hygiene. Individual instruction was given to the younger campers if their parents so requested. This problem is always delicate, but most important. It is necessary first to break down the barrier so that questions will be asked. So weird and fantastic were their ideas that it was an inspiration to see the feeling of satisfaction in their faces as questions which had haunted these young minds were answered frankly and honestly. There was no levity. Every one could feel that serious minds were seeking truth.

There are no rules for the government of the campers. Rules are made to be broken if possible, but "health aids" are posted in every bunkhouse. These are as few as possible, but the entire personnel is requested to follow them, not because they are posted by the medical officer, but for health and protection. The campers are encouraged to look upon the doctor and infirmary as protection against loss of time from activities and as an adjunct to their happiness and

comfort at camp. Underweights and overweights are given special consideration. This is done without their being held up as different from the others.

This year the epidemic of poliomyelitis called for extra precautions. No camper or counsellor was accepted from an infected area. Rigid quarantine was instituted when camp opened. After the camper was deposited at the infirmary by his parents, no further contacts from without were permitted. The camper had a careful physical examination before being released to mingle with other examined campers. The temperatures of all were taken twice daily for ten days. A rise of temperature brought an immediate isolation until a diagnosis was made. Arrangements had been made with a hospital in the vicinity to admit a doubtful case, in order that there should be no contacts with any of the camp personnel while a diagnosis was in doubt. Every effort was made to prevent fatigue, chilling, and over or improper eating. Sprays or gargles were not used as preventives. It is difficult to say whether these extra precautions were responsible for a reduction in the number of respiratory infections this year or whether, instead, it was an off year for nasopharyngeal infections.

The average caloric intake per camper was 2,404 calories. For those who were underweight, milk and crackers at bedtime brought the total to 2,664 calories, which was considered adequate. The older campers consumed more food than the younger ones. Of course special efforts were made to see that each meal was well balanced.

Following the conference after each illness to determine the possible causes, it was thought that they were as follows in the order of frequency: exposure, improper eating, sudden change in the weather, fatigue, undetermined, and emotional strain.

Of all the illnesses in camp 62 per cent were respiratory infections; 25 per cent, gastro-intestinal; 10 per cent, skin infections; and 3 per cent, miscellaneous.

Of the respiratory infections 77 per cent were nasopharyngitis; 7 per cent, influenza; 2 per cent, pharyngitis; 5 per cent, tonsillitis; 4 per cent, otitis media; 2 per cent, sinus; and 1 per cent, each, laryngitis, asthma, and hay fever.

Of the skin infections impetigo, ringworm, and boils or infected wounds were about equally divided.

The percentages of causes of accidents were as follows: 28 per cent, cuts; 18 per cent, each, sprains, bruises and falls; 12 per cent, punctured wounds; and 6 per cent, poison ivy.

The percentage of children underweight on

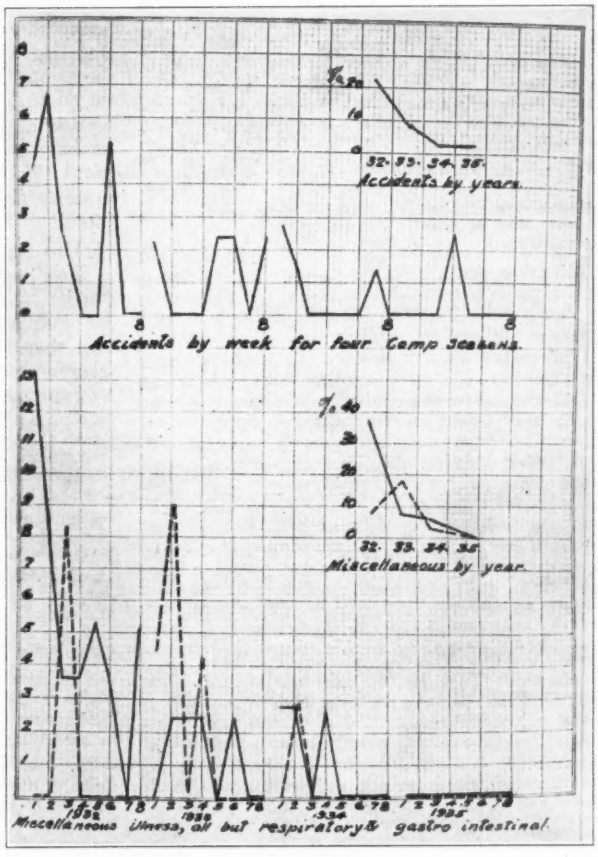

Chart 3

Per cent of accidents by weeks and by years. Per cent of miscellaneous illness by weeks and by years.

admission to both camps for the four years was 45; of these 78.5 per cent gained in weight, an average gain of four pounds. There were 11 per cent who lost, but the average loss was only 0.8 pounds; 16 per cent went to the average group. I have tried to get the weights a month after camp closed to determine the influence, if any, that camp had had on this group, but the replies were not sufficient to warrant any conclusions.

Those of average weight were 39 per cent of the campers; 38 per cent of these lost during camp an average of 2.2 pounds; 62 per cent gained an average of 3.6 pounds. Practically all of the children overweight on admission showed a loss of weight at the end of camp.

The average time lost in days per sick child in the infirmary was 1.4 days; additional days restricted from one or more activities, 2.1 days. Likewise from accidents the days lost were 1.3 days; additional days restricted from one or more activities, 2.5 days. There were no accidents at the girls' camp.

With the exception of 1935 the weeks in camp showing the largest amount of illness were the first, second, fourth and fifth weeks for the boys and the third week for the girls. While it does not seem reasonable to expect an increase during these weeks with no change in technic or routine, yet this was our experience until this year when, because of the epidemic, quarantine restrictions possibly kept out infections.

This report of the preventive efforts used in a boys' and girls' camp is given as a basis for further study. I feel that the problem should be approached from this angle. I frankly admit that I was disappointed in the amount of preventable illnesses, but only by a comparison of experiences in a number of similarly operated

Table 1

DAILY DIETARY

	CALORIES	Totals
Breakfast		
Fruit	100	
Cereal, cream and sugar	214	
Egg	70	
Bacon	50	
Toast and butter	200	
Milk	160	794
Dinner		
Meat	100	
Green vegetable	50	
Leafy vegetable	50	
Starchy vegetable	100	
Muffins and butter	300	
Buttermilk	90	
Dessert	100	790
Supper		
Meat substitute	100	
Vegetable salad, or dessert	100	
Bread and butter	200	
Milk	320	
Jelly	100	820
Bedtime Supper for Underweights		
Milk	160	
Crackers	100	260
		2664

Table 2

SUMMARY IN PERCENTAGES OF ILLNESSES IN CAMP—GIRLS

		First	Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth	Total
Respiratory Infections	1932	8.3	0	0	0	0	8.3	0	0	16.6
	1933	0	0	0	4.5	0	0	0	4.5	9.0
	1934	0	0	18.7	12.5	3.1	0	3.1	0	37.4
	1935	0	0	0	0	0	0	0	7.1	7.1
Gastro-Intestinal Upsets	1932	0	0	16.7	0	0	0	0	0	16.7
	1933	0	0	0	0	0	0	4.5	0	4.5
	1934	0	0	3.1	0	0	0	0	0	3.1
	1935	0	7.1	0	0	0	0	0	7.1	14.2
Miscellaneous	1932	0	0	8.3	0	0	0	0	0	8.3
	1933	4.5	9.0	0	4.5	0	0	0	0	18.0
	1934	0	3.1	0	0	0	0	0	0	3.1
	1935	0	0	0	0	0	0	0	0	0
Total		12.8	19.2	46.8	21.5	3.1	8.3	7.6	18.7	

Table 2—Continued

SUMMARY IN PERCENTAGES OF CAMPERS ILL AND INJURED BY WEEKS—BOYS

		First	Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth	Total
Respiratory Infections	1932	5.3	7.9	0	2.6	7.9	15.8	2.6	7.9	50.0
	1933	0	0	7.3	0	2.4	0	2.4	14.5	26.6
	1934	7.3	13.2	10.3	11.8	5.9	2.9	1.5	1.5	54.4
	1935	0	0	0	0	0	0	0	5.4	5.4
Gastro-Intestinal Upsets	1932	2.6	0	0	0	2.6	0	0	0	5.2
	1933	4.9	2.4	0	4.9	0	0	0	0	12.2
	1934	2.9	2.9	1.5	10.3	1.5	0	4.4	0	23.5
	1935	2.7	0	0	0	5.4	5.4	0	2.7	16.2
Miscellaneous	1932	13.1	7.9	2.6	2.6	5.3	2.6	0	5.3	39.4
	1933	0	2.4	2.4	2.4	0	2.4	0	0	9.6
	1934	2.9	2.9	0	2.9	0	0	0	0	8.7
	1935	0	0	0	0	0	0	0	0	0
Total		41.7	39.6	24.1	37.5	31.0	29.1	10.9	37.3	
Accidents	1932	5.3	7.9	2.6	0	0	5.3	0	0	21.1
	1933	2.4	0	0	0	2.4	2.4	0	2.4	9.6
	1934	2.9	1.5	0	0	0	0	1.5	0	5.9
	1935	0	0	0	2.7	0	0	0	0	2.7
Total		10.6	9.4	2.6	2.7	2.4	7.7	1.5	2.4	

camps can the true facts be known. Then only can we determine the value of such measures as will reduce or eliminate illness and accidents in camp.

33 Ponce de Leon Avenue

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2. Sanders, J. Edward: Safety and Health in Organized Camps. New York: National Bureau of Casualty and Surety Underwriters, 1931.

DISCUSSION (*Abstract*)

Dr. Clark H. Hall, Oklahoma City, Okla.—The summer camp has been more or less taken for granted and as a result neglected. As Dr. Funkhouser has said, there has been a marked increase in these camps and more are being established each year. Some are well managed in every way, including medical supervision, but many are poorly managed in many respects and have a minimum of medical supervision if any at all. Some camps are born of philanthropic motives and others are purely commercial. The effectiveness of most can be increased. In general the summer camp has two types of children: those who are sent for a vacation away from the larger cities and whose parents feel that the camp offers a safe vacation and a chance to develop self-reliance; and those who are sent because of poor general condition or for other reasons. The methods of handling children of this type are quite different in many respects and the responsibilities are beyond the grasp of the average camp director. To be present at sick call is certainly a small portion of the physician's work, as Dr. Funkhouser has mentioned. The more attention paid to the preventive angle, the fewer the accidents and the smaller the sick list. The medical director should be one who can see the youngster's point of view and reach him in the individual problems that are bound to come up. The matter of allowing children to carry on their activities in excess of their ability and as a result have a serious depletion of energy is most important and is one of the biggest mistakes made in the average camp. Such children go home tired at the end of the camp. As has been pointed out, a camp may be well supervised without having burdensome rules which will cause resentment. This depends upon the ability of the medical director. The best results will not be obtained unless he is enthusiastic and really interested.

Dr. Hugh McCulloch, St. Louis, Mo.—These observations show clearly that summer camps need medical supervision. The situation reported by Dr. Funkhouser is probably similar to that in most other camps with only slight variations due to local conditions. Summer camps are increasing rapidly in number. They vary in their nature a great deal, and the present situation probably is similar to that in which the private schools found themselves twenty or more years ago. Eventually there will be a more uniform standard, especially among the better camps. The bad ones should be either improved or discontinued.

Since children attending camps come largely from cities where most pediatricians are located, we as a group should have a real interest in the medical supervision of camps as well as other features, and should be ready to give assistance when needed. We can help a great deal by selecting the proper camp for each child, in the same way that one would select a school. Proper adjustment of the child to the camp is essential to the success of the whole plan. It is unfortunate, in my opinion, that camp experience of some kind is not available for all children who desire it, especially for those during the camping age of 12 to 16 years. The educational value of the experience is important, and this serves to fill in the unnatural and faulty gap during the summer months between the closing and opening of school. There may be many obstacles to such a plan, but it is unfortunate that schools see fit to close for at least one-fourth of the year. Certainly children do not cease their educational activities during this time.

Dr. Funkhouser (closing).—I have met a number of camp directors, both men and women, and all are high type individuals. They are anxious for constructive assistance and feel their responsibility for the health and care of the campers intrusted to them. We should take an interest in their problems. We are especially qualified to advise them from the preventive angle. Rather than condemn camping as an institution we should, as Dr. McCullough says, know where our patients go. I wish to suggest that we go further; that is, assist in raising the standards of all camps. The directors will welcome it, especially if they have a vision of preventive medicine.

Any success which I may have had has been largely the result of three factors: first, the cooperation of the director; second, the perseverance of the resident physician; and finally, probably the most important, the counsellors. If a counsellor is selected solely because he has gotten the required number of campers, and feels that his work is completed and that he is at camp for his vacation, no progress will be made with his group.

Counsellors must be selected with utmost care. The idea of prevention must be sold to them and they should be constantly reminded of their responsibility. They must be on the alert for the three greatest causes of camp difficulties: fatigue, insufficient sleep, and worry.

I feel that we have accomplished results in the miscellaneous illnesses and accidents. Respiratory infections have caused the greatest concern, for which we have found little or no method of prevention. I will say, however, that many suspects did not have a true infection. In the beginning it was impossible to differentiate infection from a physiological hypertrophy of the nasal mucosa from the cold mountain air, but they were considered and treated as infections until proven otherwise. Closer observation, especially on hot days after strenuous exercise, should reduce the gastro-intestinal upsets. Often hunger is mistaken for thirst, so over-eating, especially without sufficient time to rest, and the taking of fluids, causes digestive upsets.

I believe our active participation in camping will prove a benefit to the youth of America so that it will cease to be what it often is, a hazard.

TUBERCULOSIS AS A PUBLIC HEALTH PROBLEM TODAY*

By Albert E. Russell, M.D., F.A.C.P.†
Washington, District of Columbia

The reduction in death rates of a number of diseases is a record of evidence of great progress in public health. One of the most outstanding examples of reduction of incidence of disease is tuberculosis; however, it still causes more deaths each year than any other communicable disease. The problem of tuberculosis is intricately bound up with almost every aspect of our life. The decline in tuberculosis has been phenomenal and has not been localized, but has taken place throughout the civilized world. Education and improvement in all spheres of life have no doubt been responsible for the reduction in incidence of this disease. The death rate from tuberculosis in the United States of America in 1900 was approximately 200 per 100,000, while in 1933 the rate was 59.5.

The trend of mortality from tuberculosis of the lungs in the United States of America (Registration Area 1900) by age groups and sex is shown in the following graphs:

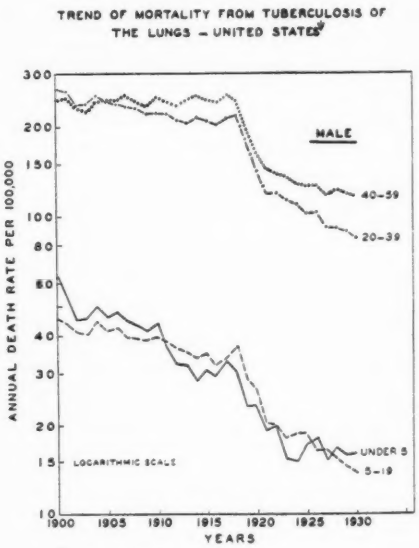
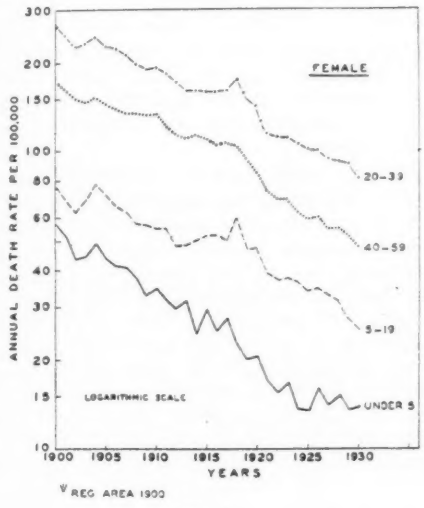


Fig. 1

*Read in Section on Public Health, Southern Medical Association, Twenty-Ninth Annual Meeting, St. Louis, Missouri, November 19-22, 1935.

†Surgeon, U. S. Public Health Service.

TREND OF MORTALITY FROM TUBERCULOSIS OF THE LUNGS – UNITED STATES[V]



[V] REG AREA 1900

Fig. 2

In spite of this most gratifying trend in the reduction of the disease, 79,502 persons in the United States of America died of tuberculosis in 1932. Obviously its prevention and control remain one of the most vital public health problems today. Physicians must accept it as their duty to take leadership in the control of tuberculosis, beginning with the prompt reporting of all active cases as soon as they are diagnosed. The intelligent control of all active cases is paramount in the prevention of the spread of the disease. Smallpox, diphtheria and scarlet fever are almost invariably reported promptly and conspicuous placards displayed on the homes of the affected. Leprosy arouses national interest and demand for control of the disease. The leper is isolated and exiled, yet this disease has a much lower transmissibility and does not present as widespread menace to public health as does tuberculosis. The infective tuberculous patient may continue to live with his family in communities of educated people and spread the disease. A tuberculous mother may continue to care for her children, and even nurse her infant if she chooses, without any legal interference. The finding, isolation and control of active cases of tuberculosis is one of the greatest health problems today.

THE PROBLEM OF CASE FINDING

It must be remembered that each case of tuberculosis came from another and that it does not exist without the presence of tubercle bacilli. It is patent that the eradication of the disease depends on early diagnosis and control of all active cases. Here is the problem of public health as well as of treatment, as the case must be found early to prevent spread of infection, and be given early treatment if the patient's life is to be saved. Statistics show that the majority of cases admitted to tuberculosis hospitals for treatment are in the far advanced stage, a stage when treatment can offer no hope of arresting the disease. The most important part of the hospitalization of such cases is their removal from homes where they are a menace to all with whom they are associated. The disease is a problem not only to those living in the same house, but to the whole community. In 1932, the admission of cases to tuberculosis institutions by stages were as follows:

Stage	Per Cent
Minimal	16
Moderately advanced	30
Far advanced	54

Far advanced cases made up 54 per cent of the admissions, greater than the number in early and moderately advanced stages.

One of the present methods of case finding is through tuberculin testing of school children. Positive reactors are followed up and in a majority of instances it is found that one or other of the parents has an early case of tuberculosis. This has been demonstrated in many places, but notably at the Lymanhurst School for Tuberculous Children in Minneapolis under the direction of Dr. J. A. Myers, who says:

"Through the Lymanhurst School for Tuberculous Children, the finding of tuberculosis in children has frequently led to the detection of carriers and tuberculous persons among children's associates."

The tuberculin test is the only means of detecting the first struggle in progress between the tubercle bacilli and the fighting forces of the body.

An adequate tuberculosis survey of school children, using tuberculin, x-ray and physical examination will give a good beginning for a tuberculosis program in a community. The approach to a family through their children usually secures cooperation more readily than otherwise. Case finding through tuberculin testing of children is a good method, although it is la-

mentable that the children have to become infected before the disease in a parent is found.

The problem of finding cases in industrial plants can be solved by pre-employment examinations and x-rays and subsequent examinations at intervals. This should be supplemented by sickness records, inasmuch as loss of time from fatigue, repeated "colds," pleurisy, and so on, will give reason for a thorough physical examination. Complete loss of working capacity does not come early in the disease. The recognition of early cases in industry will benefit the worker by permitting early treatment and also will give a greater benefit to the community and to his family by removing him, a source of infection, to an institution for treatment.

PROBLEM OF THE DISEASE IN YOUNG ADULTS

It has been shown in *Figs. 1* and *2* that the greatest incidence of tuberculosis, male and female, occurs in the age group 20 to 39. Miss Downs[2] has presented similar evidence for the age group 20 to 29. This (20 to 39) is the child-bearing age and the contact between adults and children is greatest during this period of life, which is important from the point of contagion. It would seem paramount in tuberculosis programs to give special attention to young adults. Thorough and frequent examinations and x-rays should be made.

Teachers usually begin their careers soon after the age of 20 and quite often a teacher is found to have tuberculosis. The menace to public health from a tuberculous teacher is obviously great, as children are very susceptible to infection. All teachers should be certified as being free from active tuberculosis before being employed and re-examinations should be made at intervals. Such examinations, checked by x-ray, should be done by physicians well versed in the diagnosis of tuberculosis or at tuberculosis dispensaries.

College students and student nurses, who make up a goodly number of the population and a most important group, offer a splendid field for tuberculosis work among young people. Here again early diagnosis is necessary both from a public health point of view and for treatment.

THE PROBLEM OF TUBERCULOSIS IN CHILDREN

Tuberculosis challenges the life, health, happiness and future of children. The incidence of infection gradually increases during the years of childhood. Only a few show signs of infection during the first six months of life; however, half of the children 15 years of age will give a positive reaction to tuberculin. It is generally thought that childhood tuberculosis is fundamentally a benign infection. However, it is the opinion of many that it actually renders them more susceptible to the tubercle bacillus and that reinfection will give rise to the adult type of the disease.

The examination of school children on an extensive scale during the recent years has proven to be a very important factor in finding tuberculosis, not only in the children but in their families as well. These examinations are very important, as pre-clinical cases are frequently found by this procedure. Much has been said of tuberculosis in the "teen age" and in a number of colleges students are being examined routinely. A higher percentage of infection in students has been found where such programs are conducted. This means, of course, that the percentage is higher only because the cases are known and that it is more or less an index of what may be found in almost any of the colleges.

It seems that the best field to begin tuberculosis programs is in the elementary schools. A number of cities have such programs and provide fresh-air schools for suspects and those children who have had prolonged exposure. Medical care of tuberculous patients should be coordinated with a school regime and the local tuberculosis and public health agencies. All school children should be tuberculin-tested as a part of the program of school hygiene. School hygiene programs afford a splendid opportunity for health education in relation to tuberculosis. The disease is brought on by environmental factors which enter into the life of each individual. It is different in its manifestations from any other infectious disease. Its incubation period is not definitely known; it may be three weeks or even years, and for that reason the careful observation of the school child becomes all the more important.

Dr. Walter Rathbun has carried on a most interesting survey of tuberculosis in school children in Chautauqua County, New York, which has extended over a period of years. The children were not selected, but taken routinely. He found that 1.3 per cent of them had tuberculosis of the lungs, either active or healed. Some of them were robust and actively engaged in sports. He also found that of the children who had prolonged exposure to the disease, 8

per cent had positive infection. Korns[3] found that 69 per cent of the contacts in Cattaraugus County, New York, showed a positive reaction to tuberculin tests and that non-contacts showed only 13.3 per cent positive reactions. Nine and three-tenths per cent of the rural children gave positive reactions, while 17.5 per cent of the city children had positive reactions.

School authorities and parents will be cooperative if they are properly approached and tuberculin testing and x-ray examinations should be employed more generally than they are at present.

THE TUBERCULOSIS PROBLEM IN THE NEGRO

The appallingly high death rate from tuberculosis among the negroes indicates that one of the greatest public health problems in relation to tuberculosis exists among these people. The greatest portion of them are lacking in education as to means of preventing infection, and their economic and living conditions are quite conducive to spread of the disease. Here lies a field for humane work and they are very responsive to health work of any nature. Another problem exists in relation to tuberculosis among them, as the greater percentage of domestic servants and nursemaids in the South and Middle Atlantic States are negroes. There are a number of cases on record where children have become infected from nursemaids and servants. Tuberculosis in negroes is, therefore, a problem that is not confined entirely to their own race.

It is probable that the negro does not possess as great resistance to tuberculosis as do white people; however, the picture might look entirely different if the level of education and economic status were brought up to those of the whites. More tuberculosis work must be done among the negroes to prevent spread of the disease. They are greatly in need of health education, and tuberculosis prevention should be a major part of such programs when they are undertaken.

PROBLEM OF CONTROLLING ACTIVE CASES

The problem of inducing active cases of tuberculosis to accept treatment is one which confronts every tuberculosis dispensary. The active case is a menace even in the best of homes. I have not seen home treatment successfully carried out, as there are too many things to disturb the peace and quiet necessary to the patient.

One of the public health problems in relation to tuberculosis is the migratory tuberculous patient. He is frequently urged by his physician to change climate and in many instances he does not need to be urged. Many tuberculous persons leave home and find lodging in hotels and boarding places and therefore become a menace to the health of others. It also places a burden on communities, as these persons are likely to become public charges. Control of migratory tuberculous persons is urgently needed.

Institutions are available in almost every state where scientific care and treatment may be given to the tuberculous. There are 87,000 beds available in the United States and there are over 7,000 nurses engaged in tuberculosis work. In 1904, there were 20 dispensaries and in 1928 there were 1,454. All of these are diagnostic centers and sources of information and education. One of the problems is to have them extend their field of usefulness to reach every active case of the disease. These institutions, while insufficient in number over the country, have the organization and knowledge to handle the work. They need the public interest and support to be able to give the maximum service. All of the state departments of health do not have separate divisions or bureaus of tuberculosis; in fact, only 13 states and one territory have such an organization.

The cost in suffering and anxiety is not measurable, but those who have had contact with institutions and dispensaries know that it is great. The cost in dollars and cents is more tangible and incidentally more appealing to the public in campaigns against the disease. Dr. Sawyer and Dr. Richard[4] have presented some interesting figures on what cases of tuberculosis cost. They made an intensive study of all the costs involved in 100 cases of tuberculosis in an industry and found that the average cost per case was as follows:

Minimal stage	$ 3,218
Moderately advanced	5,578
Far advanced	4,061
Total for 100 cases	$406,162

The average loss of working time due to illness from the disease was 2 years and 15 weeks (or 595 working days).

TREATMENT IN RELATION TO PUBLIC HEALTH

The treatment of tuberculosis must continue and become more closely integrated with the public health aspects of the disease. More effective therapeutic measures must be found pri-

marily for the patient's sake, but it is most important for public health reasons. If the length of the infective period of the disease could be shortened by effective treatment, it would automatically reduce the incidence of the disease. Much information relative to the metabolic changes which take place in the course of tuberculosis is needed on which to base more effective treatment. We know that tuberculosis reduces the copper content of the lung in direct proportion to the extent of the lesions. Tuberculous patients also show a diminished tolerance for sugar. It seems important that we should know more about calcium metabolism in this condition, inasmuch as it is a factor in the healing of the disease. More knowledge is needed on the effects of vitamins both in the treatment and prevention. Such studies must include observations of the endocrine system, since metabolism depends on endocrine secretions. More should be known about the relation of allergy to tuberculosis.

EDUCATION

Education of the tuberculous patient and his family and all contacts is both a problem and responsibility. It is a duty which cannot be neglected if the tuberculosis death rates are to continue to decline. Health education, yet in its infancy, has been one of the major factors producing a decline of tuberculosis. People know more about diets, vitamins and hygiene than they have ever known, but the process must continue and be made available to all classes and races. Health knowledge can be easily disseminated today by the press and radio. Health programs are popular and health education has been given a great impetus by these means of communication. Tuberculosis should be given greater prominence on these programs. Health education in relation to tuberculosis must not be left up to the tuberculosis agencies entirely. They are unable to reach every one. It must be a part of every educational campaign in relation to health.

The educational program should include the general practitioner of medicine. He needs to be able to recognize the disease earlier and to see that all contacts are given observation. This is primarily the duty of the physician and he should emphasize the importance of reporting infectious diseases.

FACTORS RESPONSIBLE FOR THE REDUCTION OF THE TUBERCULOSIS DEATH RATE

The great strides in education and the general improvement in living conditions as well as shorter working hours are factors which have helped to reduce the incidence of tuberculosis. Institutional treatment of the disease has also been important in this regard. One of the most remarkable influences has been the pasteurization of milk and tuberculin testing of cattle. The infected cattle, when found, have been removed from the dairy herds and slaughtered and, as a result, bovine tuberculosis is fast disappearing. During the fiscal year 1935, 25,237,532 cattle were tested for tuberculosis by Federal, State and local authorities. School hygiene and the examination of school children have also helped in the decline of tuberculosis. The provision of better recreational facilities for children of the cities has also been of assistance.

Physicians in general are better diagnosticians of tuberculosis today and the disease is being recognized earlier and given treatment. More attention is being given to the "cured" tuberculous patient to prevent a recrudescence of his disease and thereby prevent his untimely death and the infection of others. Industrial hygiene has brought about less tuberculosis in industry and has educated the worker relative to his health.

These processes are steps in the right direction; however, they are not universally applied. We can expect that these measures will continue to have wider application and we can look for still further reductions in the incidence of tuberculosis.

SUMMARY

Tuberculosis has declined in direct proportion to better education and hygiene. It still is a major public health problem, as more than 79,000 persons in the United States of America died of the disease in 1932.

Cases must be found early to facilitate cure and prevent spread of infection. At present the greatest percentage of cases admitted to hospitals for treatment are in the far advanced stage.

Tuberculosis is a great expense to the nation. It disables for long periods, causing great distress and poverty. Young adults are particularly prone to have it when the men are most valuable to industry and when the women are in the child-bearing age.

Tuberculosis challenges the life, health, happiness and future of children. Childhood tuberculosis offers a fruitful field in tuberculosis work.

Tuberculosis in the negro is one of the greatest problems of this disease. Education and social and economic improvement among them are greatly needed.

More effective therapeutic measures are needed to shorten the course of the disease and the period of infectivity.

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DISCUSSION (*Abstract*)

Dr. Louis C. Boisliniere, St. Louis, Mo.—"The Problem of Controlling Active Cases," one of the captions of Dr. Russell's paper, confronts every physician treating sputum-positive cases. The only known specific cause of tuberculosis in the individual and of its dissemination among others is the mycobacterium, *Bacillus tuberculosis*. There are many other contributing causes such as malnutrition, low wage, overwork, child labor, insanitary environment at home and in industrial plants, inadequate public education, and a host of others. The endeavor to meet and solve these problems is the object and raison d'etre of other agencies. The physician's battle, both offensive and defensive, is with the tuberculosis germ. He is usually the first to discover the disease and conduct it to its termination. Preventive epidemiological efforts will be limited if not rendered futile unless the family physician assumes and boldly, aggressively and adequately meets this twofold responsibility to his patient and the public.

So long as there are tuberculosis germs in the sputum the disease is active and the patient a source of possible danger to others. If the coughing out and expectoration of infected sputum be controlled by proper safeguards the infected individual need be a menace to no one. The importance of continuous and meticulous instructions in this regard must be thoroughly drilled into the patient and his attendants. The hazards and limitation of contamination to others should be clearly imparted. Too much exaggeration of these is equally reprehensible as too little. To create a neurotic, unreasonable phthisiobia in our patient and those coming in contact with him is unjustifiable, unfair and inhuman. These people are not pariahs, to be shunned as if they were lepers. So much material injustice has been meted out to those suffering from tuberculosis and to their families that it is time to take a reasonable and sane attitude in this regard. Landlords have ordered tenants to move, employment has been refused and terminated even to healthy members of the family of a tuberculous patient. So widespread has this unwholesome fear of contagion of the disease become that even employes have protested against working with one in whose family there happens to be a case of tuberculosis. Over-zealousness, because it may err on the side of over-prudence, does not atone for its ill effects. I plead for a just and humane consideration for our patients and their families. That tuberculosis is extremely contagious to infants and children is amply proven, and strict isolation from every source and contact must be rigidly enforced. In adults and at full maturity the danger of contracting and developing active tuberculosis from without is limited, as all of us who have worked in a tuberculosis milieu for many years can amply testify. That there is some hazard cannot be denied, and it justifies all preventive measures.

Early diagnosis and even the care and regimenting of tuberculous suspects again lies with the family physician. The prevalence and ubiquitousness of the disease should keep him alert and tuberculosis minded at all times.

It does not take a Napoleon of finesse in diagnosis or virtuoso in physical signs to detect early tuberculosis. Any educated physician with his ordinary knowledge and equipment can do so. But it does require painstaking and time-taking investigation. The symposia on tuberculosis carried out annually by the St. Louis Health Department, as outlined by Dr. Spector, demonstrates the avidity and keen interest of the profession in tuberculosis, their awareness of its importance, and efficacy of the newer methods for treatment and control. The trend is now for the earlier inducement of artificial pneumothorax. Just so soon as a definite diagnosis of tuberculosis with positive sputum has been made pneumothorax is indicated. If the involvement be a small area, only sufficient gas should be introduced to compress the diseased area. The so-called selective pneumothorax of Barlow first commenced at Mt. St. Rose and has been successfully carried out there since. It is astonishing how quickly the sputum becomes negative and the stay in the sanatorium shortened under this treatment.

The procedure is of great epidemiologic significance. The closure of cavities by pneumolysis and pneumothorax, phrenic crushing and thoracoplasty has contributed a great deal to limiting the spread of the disease by rendering the sputum negative.

The "Problem of Controlling Active Cases" is essentiall that of the physician. He must abandon the old *laissez-faire* Fabian policy of no contest and aggressively attack the disease, thus aiding patients and contributing his share to the preventive epidemiologic efforts of others.

The Nomad tuberculosis patient is quite a factor in the spread of the disease, as so many of these travelers are without adequate means and are obliged to seek undesirable quarters and are usually unable to provide for themselves the essentials of proper care. There is not one scintilla of conclusive scientific evidence that climate is essential in the treatment of tuberculosis. Many of these patients are eating their hearts out because of a fanatical Ponce de Leon faith in the magical effects of climate that amounts almost to a fetish. In all humanity, they who cannot afford to command the essentials in treatment should be reassured that their case can be conducted successfully at home as well as in any other climate, no matter how salubrious it may be. Thus the menace of the Nomad can be at least restricted and limited.

Dr. H. I. Spector, St. Louis, Mo.—Dr. Russell's painstaking analysis of the tuberculosis problem reveals many

facts which concern the health officer. For instance, he points out that despite the progress that has been made in the control of the disease in the past twenty-five years, it nevertheless still causes more deaths each year than any other communicable disease. What are the reasons for this tremendously high mortality? The answer is obvious, if we take into consideration the fact that approximately 85 per cent of the tuberculous patients in sanatoria are in either the second or third stage of the disease. It is the belief of the writer that if we are to control this disease, we must at first find some way of recognizing it early; and second, we must urge immediate treatment of the disease after it is discovered in the early stage.

About three years ago the writer was interested in this very point and sent a questionnaire to all the physicians of St. Louis asking them the reasons for delayed reporting of cases, since over 50 per cent of our cases of tuberculosis were reported either after death or a month before death. The answers received varied, but the greatest number of physicians felt that it was due to two main factors: (1) negligence on the part of the patient in seeking medical advice; (2) inability on the part of the physicians to recognize the disease early. These reasons convinced us that if we are to control tuberculosis we must recognize the disease in the early stage and in order to accomplish this we must first educate the laymen to seek medical care early, and second, we must teach the physicians the newer methods in the diagnosis of early tuberculosis. It is with this view in mind that we organized clinical conferences on tuberculosis for both white and negro physicians. These conferences have proven successful. The success of these conferences has encouraged us to organize conferences in communicable diseases, one of which was held last April, and we are now planning to experiment further by offering courses in maternal hygiene and child hygiene during the coming December. We believe that by offering to the general practitioners the clinical facilities of the Health Department, we are bringing to the physicians a closer understanding of the aims of the Health Division and we thus secure better cooperation.

Dr. Russell mentions the use of the tuberculin test. It is my belief that the value of the tuberculin test has been somewhat overestimated. I believe in it diagnostically when it is negative. A positive reaction only points out that a source of infection has existed or is existing in the environment of the child and calls for an examination of the contacts.

Finding tuberculosis in industry is a relatively new approach to the problem and should certainly be encouraged.

Industry is a great factor in both the production and in the control of tuberculosis. Improving sanitary conditions in industry and improving living conditions of the employes, through adequate compensation for services, will do a great deal to control tuberculosis.

Dr. Russell has mentioned the examination of teachers in the schools. This cannot be overestimated. There is no question that tuberculosis can spread in the schoolroom just as other communicable diseases do.

In regard to the tuberculous negro, it is a known fact that cities with a large negro population have a high tuberculosis rate. In our own city over 40 per cent of the deaths from tuberculosis are in negroes, despite the fact that they represent only 12 per cent of the population. I am not a follower of the theory that the main reason for the high negro incidence rate and mortality rate is his susceptibility to tuberculosis. My observation leads me to believe that the latter reason is relatively unimportant when compared with the tremendous economic handicaps that the negro faces daily. To my mind this is the real reason for the high negro mortality. Improve the economic status of the negro and the death rate will fall.

Lastly, I want to touch on a problem which is of the greatest importance, namely: the question of the rehabilitation of the tuberculous. It is not sufficiently emphasized that a majority of discharged tuberculous patients who suffer relapses after an arrest of the disease are recruited from the underprivileged classes and have not had the advantages of educational and vocational training. The economic status of the majority of tuberculous patients is such that immediately after discharge from the sanatorium they are prematurely compelled to accept full-time employment. Because of lack of choice they are frequently forced to accept unsuitable employment. Inevitably such premature full-time unsuitable employment promotes a reactivation of the disease. Vocational training while the patient is in the institution will bridge the gap between the measured pace of sheltered sanatorium life and the accelerated momentum of industrial life, and this will prevent future relapses and thus mitigate future new infections to the community.

I wish to close my discussion with the following: tuberculosis is not only a public health problem of today, but will remain for some time a problem of tomorrow.

Dr. Oscar O. Miller, Louisville, Ky.—In 1928 we x-rayed all the teachers in the Louisville Public School System and found 1.4 per cent with moderately and far advanced pulmonary tuberculosis. Some of these were arrested cases and all they required was a transfer to other positions which did not bring them in intimate contact with children. Others had active disease and it was necessary to eliminate them from the school system. We are unable to say how much of a factor such cases are in the spread of tuberculosis, but they must be considered as a source of infection.

We have periodically x-rayed all the new teachers coming into the school system since then. In the colored teachers we found it necessary to repeat the examination, as some of these had broken down with tuberculosis in the interim. Some of the teachers have minimal and arrested lesions and these have been permitted to remain in the school system and are kept under observation through the Tuberculosis Dispensary. They report at stated periods for re-examination and re-x-ray.

The tuberculin testing program in the school has been responsible for finding forty cases of adult tuberculosis in the school children in the past four years. The percentage of positive reactors is as follows:

Graded schools	19.8
Junior high schools	26.5
High schools	32.7

The colored school children show considerably higher percentages, namely:

Graded schools	27
Junior high schools	38.9
High schools	61.4

One cannot over emphasize the necessity for the x-ray

examination of all nursemaids and for all persons conducting boarding homes for children. We have an understanding with all the receiving homes in Louisville to submit all incoming children to the Tuberculosis Clinic for a physical and fluoroscopic examination before they are finally accepted in the home.

It is generally conceded that the tuberculosis death rate will decline by natural means to 80 per 100,000, but to depress it below this point requires an intensive anti-tuberculosis campaign and the employment of all of the methods mentioned in Dr. Russell's paper.

FRANCIS ADAMS OF BANCHORY*

By LEWIS J. MOORMAN, M.D.
Oklahoma City, Oklahoma

On Deeside, in the parish of Lumphanan Aberdeenshire, March 13, 1796, Francis Adams was born. There is no record of wide acclaim or excitement, even in his own home parish. Available biographic data indicate that his father was a small farmer, possessing no obvious marks of distinction. Though silence envelops the character and personality of his mother, our present day perspective warrants the belief that she belonged to that silent throng of God's good and great who escape the terrestrial heralds of fame.

At any rate, it would appear that this son of the soil quit his mother's womb with a latent spark of genius, which was to be fanned into flame by potent sources of animate energy and sustained through life by successive manifestations of exceptional psychic and physical endurance. Among his prenatal gifts, we also count his indomitable will, which helped to keep him safely on the sea of life.

Apparently his early education was uneventful and conformed to that of his companions. However, the flair for accomplishment was evidently in the process of evolution. At the age of 15 he entered the grammar school at Aberdeen. In Dr. John Brown's delightful biographical sketch, we find in Dr. Adams' own words the following story of a great awakening during this grammar school period, which was to be followed by intense sustained, victorious effort in preparation for a most significant phase of his exceptional career:

"As far as I can think, my classical bent was owing to a friendship which I formed, when about 15 years old, with a young man a few years older than myself, who had enjoyed the benefits of an excellent education at Montrose, which gave him a superiority over myself that roused me to emulation.

"In my early days I had been shamefully mistaught. I began by devoting seventeen hours a day to the study of Virgil and Horace, and it will be readily believed that such intense application soon made up for any early deficiencies.

"I read each of these six or seven times in succession. Having mastered the difficulties of Latin literature, I naturally turned my attention to Greek as being the prototype of the other.

"It was the late Dr. Kerr, of Aberdeen, who drew my attention to the Greek literature of medicine, and at his death I purchased a pretty fair collection of the Greek medical authors which he had made. However, I have also read almost every Greek work which has come down to us from antiquity, with the exception of the ecclesiastical writers; all the poets, historians, philosophers, orators, writers of science, novelists, and so forth. My ambition always was to combine extensive knowledge of my profession with extensive erudition."

In pursuit of this worthy ambition, he secured a scholarship at Kings College, where he won his M.A. degree and passed on to the study of medicine. Having completed his courses in medicine, he settled in Banchory-Ternan and became a country practitioner of medicine and surgery. Certainly the full measure of ordinary man would be required to meet the inexorable demands of a heavy country practice, covering the births, the lives, the accidents, the afflictions, and deaths, of a "wild outlying region" such as Dr. Adams served. He not only withstood the sheer physical strain, but through the exercise of exceptional qualities of intellect and industry, he was always ready to offer the benefit of the newest knowledge of medicine and surgery, and through the patient and skillful practice of the art of medicine, he was able to establish a lasting abode in the hearts of his people.

Through the happy blending of these functions, he reached the high mark of professional accomplishment. However, over and above this perfected service to the people of his relatively obscure community, he lifted the inextinguishable torch of his coveted erudition. He achieved an enviable reputation in pure scholarship through translations of, and commentaries on, Greek and Latin works of literary merit, and through his appendix to Dunbar's Greek Lexicon, and his share in compiling the last edition of the latter.

Fortunately for medicine, in all parts of the world where the English language is employed, he devoted his profound knowledge of Greek to the task of discovering, collecting and translating all that was known and taught in connection

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with Greek medicine, and vitalizing all by his learned commentaries. The first fruits of his labors in this connection was the translation of Paulus Aegineta. The first volume, published in 1834, attracted the attention of the Sydenham Society of London and resulted in an agreement with the Council of this Society for the translation and publication of the seven books of Paulus Aegineta in three volumes, with a commentary embracing a complete view of the knowledge possessed by the Greeks, Romans and Arabians on all subjects connected with medicine and surgery.

The Dictionary of National Biography makes the following statement:

"The translation is useful, as the only English one of the writer, but the chief value of the work resides in the commentary, which shows wide and accurate learning, and gives a fuller account of Greek and Roman medicine (to some extent of Arabian also) than is elsewhere accessible in English, or perhaps in any modern language. * * * Considering the isolated position of the writer, remote from great libraries and immersed in professional work, it is a very remarkable performance."

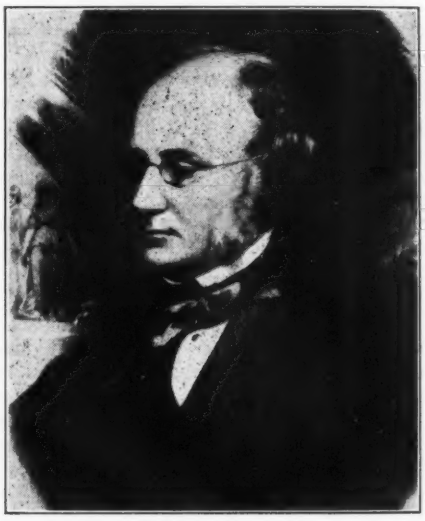
As a result of this noteworthy accomplishment, he was appointed by the Council of the Sydenham Society to the task of translating and editing the then accepted genuine works of Hippocrates. This remarkable feat was accomplished in a surprisingly short time and the "Genuine Works of Hippocrates with Preliminary Discourse and Annotations" appeared in two volumes in the year 1849. The value of this translation is obvious when we consider that it is the only complete English version of Hippocrates.

No doubt encouraged by the enthusiastic reception of Adams' translation of Hippocrates, the Sydenham Society proposed the translation of Aretaeus. This proposal resulted in the Adams' "New Edition of the Greek text and a literal translation of the same into English," which was published in 1856. It is said that his Aretaeus "involving references to important libraries, brought Adams into communication with many English and foreign scholars, and procured for him his honorary degree from Aberdeen."

The following quotation from Dr. John Brown is taken from Dr. Adams' memorandum of his literary life:

"I began the translation of Aegineta in the end of November, 1827, and finished it on the 28th of April, 1829. I never, at any period of my life, underwent so much drudgery, and during three months I sat up late and rose early, and snatched every minute I could from the duties of my profession. At that time my practice, though not lucrative, was extensive, especially in the obstetric line; I managed, however, to work at my translation ten hours a day. I finished the translation of Hippocrates in about four months. The certainty of attaining a fair remuneration for the trouble it cost me, and that it would not be a light hid under a bushel, made this by far the most delightful task I ever engaged in. The reception of it was everything I could desire. It cost me some professional sacrifices, but this was amply made up by the delight and mental improvement it conferred on me."

In the performance of this scholarly service, Dr. Adams did not lose sight of his obligation to observe, record, and publish the results of his experience in connection with current medical problems, consequently he was a frequent contributor to medical journals. In addition to his professional and intellectual pursuits, he was a student of botany and ornithology, and followed both with eager eyes and a responsive heart. In this brief recital we see, in rare degree, the coveted combination of physician and scholar.



Dr. Francis Adams

He married the daughter of Mr. William Shaw and devoted much time to the care of his wife and children. He died February 26, 1861. His second son was Dr. Andrew Leith Adams.

A granite obelisk in Banchory serves as a monument to his memory; a marble bust by Brodie was presented to the University of Aberdeen by his son, Dr. Andrew Leith Adams.

It is difficult adequately to reveal the significance of the life and works of Dr. Francis

Adams in connection with medical education. It must be remembered that he stood on the high ground which had been reached through the anatomy of Vesalius, the physiology of Harvey, the pathology of Morgagni, the clinical methods of Sylvius, Sydenham, Boerhoave, and Cullen, supplemented by the experimental pathology of John Hunter and marked by Jenner's first experimental vaccination against smallpox in the year of Adams' birth. Is it possible he anticipated the coming of a great revolution in the field of medical science, which, through investigation, experiment, invention, and the utilization of inanimate energy was destined to usher in the cold and impersonal trends of our own highly mechanistic and ultra-scientific age!

It matters not whether Francis Adams was inspired by prophetic vision or whether he was driven by a compelling passion for ancient learning; he placed all future generations under obligation to him for assembling the evidence and recording the truths which establish the fact that the very foundation upon which modern medicine stands is dependent upon the art of medicine, and the venerated code of ethics as practiced twenty-five hundred years ago by "the divine old man of Cos."

The master physician, Sir William Osler, once spoke on "Medicine's Debt to Greece." It now becomes our privilege to speak of medicine's debt to Francis Adams, whose interest in Greek culture has opened a corridor through which the picturesque founders of modern medicine come marching into our very presence; through which the progenitors of medical education convey to us the immutable principles of the Hippocratic school; and finally, through which comes the venerated physician's oath referred to by Gomperz as "A monument of the highest rank in the history of civilization."

Professor Gomperz, in his monumental work, "Greek Thinkers," devotes Book Three to "The Age of Enlightenment," and occupies the opening chapter with a discussion of the physicians. From this interesting chapter, in which the field of scientific inquiry is so well worked, and in which the physician is characterized as the champion of constructive imagination and the "sleepless critical spirit of investigation," we quote the following message, which sounds a note surprisingly modern. After referring to the apprentice years devoted to the mere collection of facts and followed by vague, restless speculation, Gomperz says:

"These had now lasted long enough, and it was time for the Meisterjahre of quiet, methodical research to succeed if science was to acquire steady and sedentary habits instead of losing itself in a maze of phantasies, revolving in idle circles. It is the undying glory of the medical school of Cos that it introduced this innovation in the domain of its art, and thus exercised the most beneficial influence on the whole intellectual life of mankind. 'Fiction to the right! Reality to the left!' was the battle cry of this school in the war they were the first to wage against the excesses and defects of the nature-philosophy. Nor could it have found any more suitable champions, for the serious and noble calling of the physician, which brings him every day and every hour in close communion with nature, in the exercise of which mistakes in theory engender the most fatal practical consequences, has served in all ages as a nursery of the most genuine and incorruptible sense of truth. The best physicians must be the best observers, but the man who sees keenly, who hears clearly, and whose senses, powerful at the start, are sharpened and refined by constant exercise, will only in exceptional instances be a visionary or a dreamer."

Sir Henry Sumner Maine has said:

"To one small people * * * it was given to create the principle of progress. That people was the Greek. Except the blind forces of nature, nothing moves in this world which is not Greek in origin."

Francis Adams, more than any one who has lived, deserves the credit for preserving in English the history of the ancient art of medicine and the sources of the moral integrity of a great profession. Considering the assembled facts, the following question naturally arises. Can medical education afford to neglect these fundamental principles which must nurture and sustain all scientific progress? Dr. Adams not only placed valuable historical information in the stacks of every medical library, but he saw the need of teaching the history of medicine, and shortly before his death he suggested to his friend, Dr. Brown, "the propriety of instituting in our universities a chair of medical history." This suggestion has borne fruit, and the teaching of medical history is helping preserve the time-honored relationship between doctor and patient, which is often rudely pushed aside by the rapid development of mechanical and ultra-scientific methods.

It is doubtful that there has been a period since the time of Hippocrates when science, in cold calculation, has so readily discarded the art of medicine. It is equally doubtful that humanity, though blessed with the gift of science, has ever been so in need of the artistry inherent in wisdom, endowed with the primal sympathy of man for man.

In closing, may we recommend to all students of medicine the story of Francis Adams for emulation, and the study of his works, not only as

a source of erudition, but as a safeguard against idle complacency and the fatal hazards of ignorance and egotism.

This tabulation of Dr. Adams' principal publications was taken from the *Medical Times and Gazette* March 16, 1861:

"* * * The following is a list of Dr. Adams' principal publications; and if we remember that during all this time he was fighting for a livelihood, and involved in the multifarious and urgent duties of a "Gideon Gray," they furnish one of the most signal instances of the pursuit and mastery of knowledge under difficulties to be found even among our Scottish worthies:

(1) "Translation of Hero and Leander, from the Greek of Musaeus, with other Poems, English and Latin." Aberdeen, 1820.

(2) "Hermes Philologus, or the Connection of the Greek and Latin Languages." London, 1826. This made him many literary friends, among others Edmund H. Barker, author of Dr. Parr's Life, and Dr. Anthon, of New York.

(3) Various papers on Greek prosody, etc., in the *Classical Journal.*

(4) "On the Administration of Hellebore Among the Ancients."

(5) "On the Nervous System of Galen and Other Ancient Authors," 1829, in which the originality of Sir Charles Bell's doctrines was attacked.

(6) "On the Toxicological Doctrines of the Ancients."

(7) "On the Treatment of Malignant Ulcers of the Face."

(8) "Notices of the Greek, Latin and Arabic Medical Authors," for Barker's edition of Lempriere.

(9) "Paulus Aegineta," translation of first volume, 1834. This was a losing concern as to money, but it placed him, *per saltum,* in the first rank of learned and judicious physicians; it was an amasing *tour de force* for an Aberdeenshire surgeon, and will ever remain a memorial of his indomitable mental pluck and strong sense. The Sydenham Society gave its character as follows: 'Replete with learning, and comprising the most complete view that has ever been given of the knowledge possessed by the Greeks, Romans and Arabians, it will form a lasting monument of the industry and erudition of its author, and an honor to his country.'

(10) Several reviews in "Forbes' British and Foreign Review," 1842-'44.

(11) "Case of Dislocation of the Knee-joint, with Dissection."

(12) "English and Greek Dictionary" (Dunbar's), almost entirely done by him. The appendix, containing scientific explanations of the Greek names of minerals, plants, and animals, is the most valuable existing in any language.

(13) "Paulus Aegineta," 3 volumes, 1845-6-7, published by the Sydenham Society.

(14) A series of papers on uterine hemorrhage.

(15) Case of a woman bitten by an adder.

(16) A series of papers on the construction of the placenta.

(17) "On the Treatment of Burns."

(18) "Hippocrates," 2 volumes, 1849. Translation of the entire works, with preliminary discourse and annotations. This is Dr. Adams' magnum opus, and is a marvel of industry, exact learning, shrewdness, and judgment. We do not know anything so good anywhere as the introductory essay on the origin of Grecian medicine, the sketch of the life of Hippocrates, and the disquisition on the authenticity of the different Hippocratic treatises, and on the physical philosophy of the ancients.

(19) Assisted by Dr. Greenhill, now of Hastings, in editing "Theophilus de Fabrica Corporis." Oxon, 1842.

(20) "Arundives Devae," a collection of original Latin poems.

Southern Medical Journal

JOURNAL OF THE

SOUTHERN MEDICAL ASSOCIATION

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M. Y. DABNEY, M.D., Editor
EUGENIA B. DABNEY, M.S., Associate Editor
C. P. LORANZ, Secretary, Treasurer and General Manager

Volume 29 APRIL 1936 Number 4

EDITORIAL DEPARTMENT

SOUTHERN MEDICAL ASSOCIATION
Thirtieth Annual Meeting
Baltimore, Maryland, November 17-20, 1936

DIABETIC NERVES

Since behavior disorders and irritability are said to accompany certain cases of low blood sugar,[1] one might reasonably examine the literature for corresponding conduct disturbances in persons with sugar above the normal. According to Jordan, Randall and Bloor,[2] about 50 per cent of diabetics show evidence of a disturbed nervous system. Among a considerable series whose patellar and achilles reflexes were tested by these authors, a decrease or absence of the reflexes was noted in more than 45 per cent. Other evidences of diabetic neuritis[3] were footdrop, pain, paresthesia, hyperesthesia, numbness of the extremities, cramps, leg weakness, burning of the feet, and paresis, including bladder paresis. Symptoms of inordinate depression, emotional instability and nervousness were common.

It was considered by Jordan, Randall and Bloor that diabetic neuritis is not the result of hyperglycemia alone, but probably is more closely dependent upon vascular disease. Particularly they have attempted to associate it with chemical changes in the nerves. Pathologists' stains indicate damage to the lipid sheath of diabetic nerves, and for this reason the nerve lipids were estimated. The pelvic nerves showed a diminution in phospholipid, cholesterol and cerebroside. A much greater reduction in lipids appeared in the peripheral nerves. Severity, long duration, and poor control of the diabetes were apparently not directly related to the condition. No diabetic with normal arteries was studied. The greater the vascular disease, the greater the nerve damage, but in nerves of cases of arteriosclerosis without diabetes, there was no lipid reduction. It was considered probable that the chemical changes preceded the neurologic symptoms of diabetes.

Fat and carbohydrate metabolism are so closely interdependent in the living body that it would be quite difficult to assign any clinical response, such as diminished reflex or gangrene, to one rather than to the other: for example, to nerve changes rather than to muscle change or variations in the circulating menstruum. It is of interest that chemical pathology has progressed to the detection of variations from the normal in the fatty content of diabetic nerves.

1. Harris, Seale: Neurologic Hyperinsulinism. The JOURNAL, **28**:959, 1935.

2. Jordan, W. R.; Randall, L. O.; and Bloor, W. R.: Neuropathy in Diabetes Mellitus: Lipid Constituents of the Nerves Correlated with the Clinical Data. Arch. Int. Med., **55**:26, 1935.

3. Jordan, W. R.; and Randall, L. O.: Neuropathy in Diabetes: Lipid Constituents of the Nerves Correlated with the Clinical Data. Arch. Int. Med., **57**:414 (Feb.) 1936.

Jordan, W. R.: Neuritic Manifestations in Diabetes Mellitus. Arch. Int. Med., **57**:307 (Feb.) 1936.

VITAMIN C DEFICIENCY

Many low cost diets in common use are deficient in vitamin C, the antiscorbutic vitamin of fresh fruit. Occasionally a diet prescribed for ulcer, colitis or allergy may lack this factor, and at times individuals by choice omit necessary foods of this type, which they believe disagree with them.

Vitamin C has been chemically isolated and given the formula of $C_6H_8O_6$. It is marketed under the name of cevitamin. As with any new product, it has been tried in therapy of a hundred different syndromes. Favorable results in such conditions as purpura, pyuria, pyorrhea, agranulocytosis and other conditions have been reported. It has been tried in hemophilia

and in practically all the bleeding diatheses. According to Glick and Biskind,[1] intestinal hemorrhages are often associated with vitamin C deficiency in the laboratory; adequate C protects guinea pigs from ulcerative intestinal tuberculosis. According to other investigators, it has a tendency to protect the guinea pig heart from streptococcal infections. It is reported in certain cases to arrest bleeding conditions while increasing the blood platelet count and the serum albumin.

Muscle tissues are poor in vitamin C; in the endocrine glands are found relatively high concentrations of it. The adrenals, the hypophysis and the corpus luteum contain more than any other tissues. It is said to relieve the pigmentation of Addison's disease. The small intestine and the liver have considerable quantities. There is little C in the stomach and large intestine, but it is selectively absorbed from the blood by the small intestine. The muscle portion of the small intestine, like other muscle tissue, is poor in vitamin C. The mucosa and the region of Brunner's glands in the duodenum have most of the vitamin.[1]

Clear-cut diagnosis of "subclinical" human C deficiency, short of actual scurvy, is difficult, although recently devised tests should narrow the field. The vitamin is an oxidizing agent which rapidly loses its activity on standing. It may be estimated chemically, and the chemical technic of determining it is a great improvement over the older biological methods which were dependent upon long periods of animal feeding. To demonstrate C deficiency in human beings, the patient is given a considerable quantity of vitamin by mouth and his urinary excretion of C is estimated. In normals there is a sudden rise of urinary vitamin after C is ingested. In those who are deficient, C is retained and the urinary level does not rise.

A still simpler clinical test for C deficiency depends upon estimations of the fragility of the patient's capillaries, or the number of bleeding points which develop in a constricted area in a given time. Wright and Lilienfeld[2] have standardized this test as follows: a circle 2.5 centimeters in diameter is marked off on the forearm. The upper arm is tied with the rubber cuff of a mercury manometer at a pressure half way between the systolic and diastolic pressure of the patient, and this pressure is maintained for fifteen minutes. Petechiae in the measured area are subsequently counted. Under the conditions given, fifteen petechiae were taken as normal. Patients with a greater number were clinically benefited by administrations of cevitamin, and after therapy and retesting the number of petechiae became normal. Twenty cases were diagnosed as having C deficiency, and were treated with a scurvy diet plus cevitamin. The syndromes included, in addition to outspoken scurvy, cases of loss of weight, nasal hemorrhages, extreme weakness, nausea and vomiting, bleeding from the rectum with a sense of mass and diagnosis of a tumor, with complete recovery after C was administered. A patient was found who apparently could not utilize vitamin C by mouth, but was benefited by intravenous injections. In cases of purpura and of congenital hemophilia, there was no definite evidence of a curative effect.

With the employment of the simple tests for cevitamin deficiency, the place of this factor in therapy should soon become very definite.

1. Glick, David; and Biskind, Gerson R.: Studies in Histochemistry. VI. The Quantitative Distribution of Vitamin C in the Small Intestine. Jour. Biol Chem., **113**:391, (March) 1936.

2. Wright, I. S.; and Lilienfeld, Alfred: Pharmacologic and Therapeutic Properties of Crystalline Vitamin C (Cevitaminic Acid) with Especial Reference to Its Effects on Capillary Fragility. Arch. Int. Med., **57**:241, (Feb.) 1936.

GLEANINGS FROM RECENT JOURNALS

Blood Pressure and Angina Pectoris.—A few years ago a simple test was devised by Hines and Brown[1] to diagnose a constitutional tendency to hypertension. It was suggested that it might be used to identify patients of a very reactive vascular type, who would be liable to subsequent development of hypertension. The patient's blood pressure is taken before and after a short period in which one hand is immersed in cold water. Under the conditions prescribed an increase in vascular tension of about 15 millimeters of mercury occurs in most normal persons, due probably to contraction of the peripheral vessels. In hypertensives there is a more marked rise, and in certain young normals a con-

1. Editorial, The Hypertensive Diathesis. The JOURNAL, **28**: 388 (April) 1935. Hines, E. A., Jr.; and Brown, G. E.: A Standard Test for Measuring the Variability of Blood Pressure: Its Significance as an Index of the Prehypertensive State. Ann. Int. Med., **7**:209, 1933. Schwab, Curb, Matthews and Schulze: Blood Pressure Response to a Standard Stimulus in the White and Negro Races. Proc. Soc. Exper. Biol. & Med., **32**:583 (Jan.) 1935.

siderable rise was also obtained, which, according to these authors, should indicate a hypertensive diathesis. Extreme vascular reactivity has been reported to be more frequent in the negro than in the white, and the negro is observed to be a more frequent sufferer from cardiovascular disease.

Bitzer,[1] of Tampa, attempted to learn something of the mechanism of angina pectoris by trying the cold pressor reaction upon a group of sixty-four patients with the disease. This was to learn whether blood pressure elevation in itself, without muscular effort, would initiate an attack of angina. Half of the group studied had normal blood pressure; the remainder comprised both hypertensives and hypotensives, all of whom were subject to typical attacks. More than four-fifths of the patients complained of pain in the hand immersed in cold water. About a fifth showed marked changes in the cardiogram during the reaction to cold. More than half of those with normal blood pressure had a "ceiling" or maximal rise in systolic pressure to 150 millimeters or more during the test. Two patients showed a drop in blood pressure, with a slowing of the pulse rate, pallor and sweating about the face and head. In a patient in whom the rise of systolic pressure was 35 millimeters, a typical anginal attack was induced by the test.

The majority of angina sufferers would seem to belong to the group with hyperreactive vascular systems. Extensive peripheral vasoconstriction, as induced by the cold pressor test, however, according to Bitzer, does not initiate the anginal attack. He concludes that the cause of the attack does not lie in coronary spasm or in the nervous system.

Acid and Ulcer.—In studies of a group of patients with duodenal ulcer, Wosika and Emery[2] note that the Sippy diet abolished symptoms in all cases. However, if the gastric contents were repeatedly analyzed it was found that in nearly half the cases free acid was not controlled; that when it was controlled, probably more alkali was administered than was needed. The addition of alkali to the hourly milk and cream feedings produced little decrease in the free acid. A powdered milk preparation, alkalinized, given every hour, was a little more successful in neutralizing acidity than the usual Sippy diet. The increased protein perhaps decreased the quantity of free acid as effectively as did the alkali. The addition of alkali to milk and cream feedings produced little decrease in free acid. Complete neutralization of the acid they consider not an essential requirement for healing.

Dead Teeth.—Within very recent years, good dental authority asserted that all pulpless teeth were infected, and therefore should be extracted. More careful bacteriological investigations now report that probably nearly a third of pulpless teeth are sterile on culture.[1] Of those with complete root canal fillings half were sterile. About a fourth of the sterile pulpless teeth gave x-ray evidence of infections; therefore x-ray diagnosis was not dependable. Routine extraction of all pulpless teeth is called an indefensible procedure. Methods of distinguishing infected teeth from uninfected, in the mouth, are still not wholly dependable. It is worthy of consideration that half the well filled root canals still show infection.

1. Bitzer, E. W.: Observations on the Effect of Sudden Changes in Arterial Tension in Angina Pectoris. Ann. Int. Med., **9**: 1120, (Feb.) 1936.

2. Wosika, P. H.; and Emery, E. S., Jr.: The Effectiveness of the Sippy Regimen in Neutralizing the Gastric Juice of Patients if the Amount of Alkali is Not Varied. Ann. Int. Med., **9**:1070, (Feb.) 1936.

Ibid: The Value of a Mixture of Powdered Milk and Alkali for Neutralizing the Gastric Acidity of Patients with Peptic Ulcer. P. 1078.

TWENTY-FIVE YEARS AGO

FROM JOURNALS OF 1911

Treatment of Eclampsia.[2]—"When a general anesthetic is required to control puerperal convulsions, ether is the one admissible agent, while to saturate the system with chloroform hour after hour under these circumstances would be to vastly diminish the patient's chances for recovery. * * *

"'While venesection is the choice of many obstetricians, * * * its use has now been superseded at the Sloane Maternity Hospital by veratrum viride, nitroglycerine and chloral, and with better results. * * *

"'Chloral is administered per rectum as one initial dose, and then repeated in doses of from 20 to 30 grains from every four hours to every six hours, according to the restlessness of the patient. Nitroglycerine grains 1-100 to grains 1-50 from every two to every four hours is given hypodermically.

"'If, under the use of the larger doses of these

1. Gies, William J.: Abst. of Contributions by Vienna Section, I.A.D.R. Jour. Dental Res., **15**:199, (June-Aug.) 1935.

2. Editorial, Treatment of Eclampsia. THE JOURNAL, **4**:174, 1911.

drugs, the tension still remains high, we depend on the use of veratrum viride rather than venesection.' * * *

"The treatment of eclampsia adopted by these eminent gentlemen at the Sloane Maternity Hospital is thus described to call attention to the slow manner in which the ideas and discoveries of country practitioners win their way to acceptance by the leaders of medical thought and literature. Here is Cushney, in his latest edition of his well-known textbook on Pharmacology and Therapeutics, saying that veratrum viride might well be excluded from materia medica. Sollmann, in his latest edition of 'Pharmacology,' says: 'There is no experimental foundation for its use.' * * * Strange that results observed in frogs, dogs and guinea pigs should be so much more convincing than those upon man."

The Artificial Leech in Acute Mastoiditis.[1]—"The application of the artificial leech, while a very minor operation, almost a therapeutic measure, assumes an important part in the treatment of acute mastoid troubles. My satisfactory experience with a limited number of cases is why I bring the matter before you. * * *

"My experience includes some nine cases. * * * Clinically they were all instances of typical acute mastoid infection: middle ear disease, temperature, mastoid swelling and pain. In every case the middle ear had been freely opened without relief. In all of the cases operation seemed probable. * * * Calomel was given at first as a routine measure. An improvement was noted at varying intervals after leeching. At times it was immediate; it usually occurred the same day. * * * In every case relief was permanent, no further active treatment being necessary."

Carbonic Acid Baths in Heart Disease.[2]—"Carbonic acid baths have been used in cardiac diseases for over fifty years, and in all this time there has ever remained the question of their physiological action. * * * The statement that CO_2 baths lower a high blood pressure and increase a low blood pressure has met with a great deal of skepticism on the part of the profession. * * * The result of my clinical studies convinces me that CO_2 baths, in most cases, reduce high blood pressure, raise low blood pressure, increase pulse volume, increase elimination, increase pulse amplitude, increase heart energy, increase duration of temperature action, reduce peripheral resistance, reduce dilations and relieve nervous irritability."

1. Bird, U. S.: The Artificial Leech in Acute Mastoiditis. Ibid, p. 267.

2. Honon, J. H.: Carbonic Acid Baths in the Treatment of Heart Disease. Ibid, p. 289.

Book Reviews

Diseases of the Thyroid Gland. By Arthur E. Hertzler, M.D., Chief Surgeon, Halstead Hospital; Professor of Surgery, University of Kansas. With a chapter on Hospital Management of Goiter Patients by Victor E. Chesky, M.D., Chief Resident Surgeon, Halstead Hospital. Third Edition. 348 pages, illustrated. St. Louis: The C. V. Mosby Co., 1935. Cloth, $7.50.

The author discusses several factors which have arisen since the publication of the last edition of his work. From long observation of his older patients, he concludes that "goiter is a continuous process, the normal termination of which is a cardiac death." Hertzler holds that experience tends to more and more radical operation, culminating in complete thyroidectomies in certain selected cases. He also believes that "it has gradually been established that the basic metabolic reading is, at most, only the measure of tissue destruction and bears no evidence of the other phases of thyroid disease." Earlier and especially more complete operating is the tendency of the times.

Hertzler admits the great difficulties in classification of goiter and rejects the classification, under four headings, of the Committee on Nomenclature of the Society for the Study of Goiter on the ground that "it is inapplicable in the clinic and useless in the laboratory."

In offering his own classification he admits that it "seems somewhat formidable, but for purposes of general clinical practice is quite adequate." He classifies the disease under the following heads:

(1) Colloid goiters (goiters in children).

(2) Non-toxic colloid goiter (non-toxic adenoma of Plummer).

(3) Toxic colloid goiter (secondary toxic goiter of Plummer, toxic adenoma, Basedowified goiter of Kocher).

(4) Diffuse acute toxic goiter (Grave's disease, Basedow's disease, hyperthyroidism, dysthyroidism).

(5) Atypical toxic goiter (interstitial goiter, "forme fruste").

(6) Degenerated colloid goiter (goiter heart).

(7) Tumors of the thyroid gland (fetal adenomas, cysts, carcinomas, sarcomas and other rare tumors).

(8) Inflammatory affections of the thyroid gland.

In each of the chapters covering this classification the symptoms, differential diagnosis, treatment and pathology of the type of disease under consideration are clearly discussed.

The chapters on topographical anatomy and operative technic are splendidly illustrated by Tom Jones, the well-known medical artist, and are unsurpassed in the clearness and distinctness with which the artist has portrayed anatomic detail and steps of operation.

The Foot. By Norman C. Lake, M.D., M.S., D.Sc. (Lond.), F.R.C.S. (Eng.), Senior Surgeon and Lecturer on Surgery, Charing Cross Hospital; Surgeon, Bolingbroke Hospital; Director of Studies, London Foot Hospital; External Examiner in Surgery, Victoria University, Manchester; Late Senior Examiner in Surgery, University of London. 330 pages, illustrated. Baltimore: William Wood & Co., 1935. Cloth, $4.50.

In the first one hundred pages, the author lays a firm foundation for a discussion of the contents to follow by presenting in an understandable form and in

logical sequence the evolution, development and anatomy of the foot. Footwear, both historically and in its present day form, is exposed in an interesting and open-minded way. The subject of gait is discussed briefly, at some expense to thoroughness. After a routine method of examination is advocated, and possible abnormalities have been disclosed, the author continues with pathologic conditions commonly found.

The author has realized the need for more scientific treatment of the many common disabilities specific to the foot, because of the great economic loss. He has considered injuries, infections, acquired deformities, corns and abnormalities of the nails. More briefly he has dealt with ulcers, new growths, apophysitis, bursitis and other conditions.

Talipes, such as poliomyelitic feet and congenital conditions, were purposely omitted because of the limited scope and purpose of the text.

In this small volume the author has combined brevity with tolerance.

Southern Medical News

ST. LOUIS CLINICS

The program for the Spring Conference of the St. Louis Clinics, which is to be held April 27 to May 2, inclusive, has been completed. As indicated by the titles, the program will be directed toward meeting the problems of the general practitioner. The newer developments in medicine will be discussed insofar as their practical value is concerned. A program and further information are available at the office of the St. Louis Clinics, 3839 Lindell Boulevard, St. Louis, Missouri.

THE MISSISSIPPI DOCTOR

The Mississippi Doctor, owned by the Northeast Mississippi Thirteen County Medical Society, which has been published in Mississippi for about twelve years with Dr. W. H. Anderson, of Booneville, Mississippi, as Editor and Manager, is now the official organ of the Mississippi State Medical Association and also of the Mid-South Postgraduate Medical Assembly. Beginning with the March issue, it will publish all the papers read before the Mid-South at the February meeting. Able men throughout the United States and Canada appeared on the program. The subscription price of the *Mississippi Doctor* is $1.00 per year.

ALABAMA

The Alabama State Medical Association will hold its annual meeting in Montgomery April 21-23.

Dr. H. Earle Conwell, Birmingham, announces his association with Dr. John D. Sherrill, Medical Arts Building, with practice limited to fractures and orthopedic surgery.

Dr. Paul M. Thompson, formerly of Spartanburg, South Carolina, was recently made Health Officer of Henry County.

Dr. Robert E. Harper, formerly Health Officer of Lawrence County, has resigned to accept a similar office in Colbert County.

The Tuscaloosa County Medical Society had as guest speaker at a recent meeting Dr. Beverly Douglas, Nashville, Tennessee.

Dr. Vance Quitman Rawls, Red Level, and Miss Bessie F. Costen were married recently.

Dr. James Brown Shelton and Miss Elizabeth Caroline McReynolds, both of Birmingham, were married December 14.

Deaths

Dr. John Pomfret Long, Sheffield, aged 59, died January 4.

Dr. William Russell Callen, Birmingham, aged 58, died January 29 of ruptured gastric ulcer.

Dr. William Gabriel Lewis, Eufaula, aged 75, died December 26 as the result of an injury received in a fall.

Dr. Thomas M. Blake, Double Springs, aged 63, died recently.

Dr. George Herring, Slocomb, aged 58, died recently of pneumonia.

ARKANSAS

The Fort Smith Clinical Society has elected the following officers for the coming year: Dr. J. A. Foltz, President; Dr. A. A. Blair, Vice-President; Dr. E. C. Moulton, Secretary-Treasurer.

The Fourth Councilor District Medical Society has elected the following officers for the coming year: Dr. E. C. McMullen, Pine Bluff, President; Dr. M. C. Crandall, Wilmot, Vice-President; Dr. H. T. Smith, McGehee, Secretary-Treasurer.

The Dickson Memorial Hospital, Paragould, has elected the following officers for the coming year: Dr. R. J. Haley, President; Dr. J. A. Dillman, Secretary-Treasurer.

The State Board of Health has elected the following officers for the coming year: Dr. W. F. Smith, Little Rock, President; Dr. W. G. Hodges, Malvern, Vice-President; Dr. W. B. Grayson, Little Rock, Secretary.

The Fourth Councilor District Medical Society had as guest speakers at a recent meeting Dr. Eustace Sims and Dr. J. B. Stanford, Memphis, Tennessee.

Dr. Frank A. Gray, Batesville, announces the association with his hospital of Dr. E. S. Roberts, formerly of New York. Dr. Roberts will be Chief Surgeon of the hospital.

Dr. Warren S. Riley has located at El Dorado for the practice of pediatrics.

Dr. T. Duel Brown, Little Rock, has returned after taking postgraduate work at the Mayo Clinic.

Dr. Robert Caldwell, Little Rock, was recently made Director of the Arkansas Diamond Corporation.

Dr. A. G. Henderson, Imboden, has been made Worshipful Master of the Masonic Lodge of that city.

Dr. P. W. Lutterloh has been made a Director of the Jonesboro Y.M.C.A.

Dr. J. S. Coffman, Lavaca, has been made a Director of the Citizens Bank.

Dr. C. J. Steed, Gurdon, has been elected Vice-President of the Board of Trade of that city.

Dr. O. J. MacLaughlin, Hot Springs National Park, was recently made President of the Ouachita Area Council, Boy Scouts of America.

Dr. F. E. Baker, Stamps, has been elected Steward of the First Methodist Church.

Dr. O. R. Kelly, Sheridan, was recently made Director of the Grant County Bank.

Dr. G. K. Stephens has been made Vice-President of the Boosters' Club of Newport.

Dr. Frank Vinsonhaler, Little Rock, has been made President of the Columbia University Alumni Club of that city.

Dr. C. D. Tibbels, Black Rock, has been made Chaplain of the Masonic lodge of that city.

Dr. H. E. Mobley, Morrilton, has been made President and Director of the Federal Savings and Loan Association of Morrilton.

Dr. C. E. Benfield, Fort Smith, has been made Trustee of the Knights of Pythias lodge of that city.

Dr. S. C. Pierce has moved from Coal Hill to Hartman.

Dr. Walter W. Brown, Williford, and Miss Margaret McLeod were married recently.

Deaths

Dr. John Keen Young, Hot Springs National Park, aged 55, died recently of angina pectoris.

Dr. Hugh E. Cureton, Conway, aged 68, died February 14.

Dr. Albert L. Boen, Clarksville, aged 67, died February 5 of apoplexy.

Dr. Patrick P. Boggan, Forrest City, aged 83, died February 3 of cerebral hemorrhage.

DISTRICT OF COLUMBIA

The Medical Society of the District of Columbia will hold its annual meeting May 6-7.

Dr. Read N. Calvert, formerly Medical Director and Surgeon of the Florida Sanitarium and Hospital, Orlando, is now located in Washington and is on the surgical staff of the Washington Sanitarium and Hospital.

Dr. Wallace Mason Yater, Washington, was elected a Director of the American Heart Association at its meeting on February 3.

The Washington Gynecological Society had as guest speaker at a recent meeting Dr. Robert A. Wilson, Brooklyn, New York.

Dr. H. F. Ermshar, formerly on the staff of the Florida Sanitarium and Hospital, Orlando, is now a member of the staff of the Washington Sanitarium and Hospital.

Deaths

Dr. William Holland Wilmer, Washington, aged 73, died March 12 from heart disease.

Dr. Arthur MacDonald, Washington, aged 80, died January 17.
Dr. Isabel Haslup Lamb, Washington, aged 72, died January 18.

FLORIDA

The Brevard County Medical Society has elected the following officers for the coming year: Dr. I. F. Bean, Melbourne, President; Dr. N. T. Counts, Cocoa, Vice-President; Dr. Bob Schlernitzauer, Rockledge, Secretary-Treasurer.

The Broward County Medical Society elected the following officers for the coming year: Dr. E. M. Hendricks, Fort Lauderdale, President; Dr. R. H. Stovall, Fort Lauderdale, Vice-President; Dr. Robert E. Blount, Fort Lauderdale, Secretary-Treasurer.

The Hillsboro County Medical Society has elected the following officers for the coming year: Dr. William C. Blake, Tampa, President; Dr. Robert C. Black, Plant City, Vice-President; Dr. James S. Gamble, Tampa, Secretary-Treasurer.

The Marion County Medical Society has elected the following officers for the coming year: Dr. J. N. Moore, Ocala, President; Dr. Carl S. Lytle, Dunnellon, Vice-President; Dr. R. C. Cumming, Ocala, Secretary-Treasurer.

The Duval County Hospital, Jacksonville, has elected the following officers for the coming year: Dr. Robert B. McIver, President; Dr. Clayton E. Royce, Vice-President; Dr. T. M. Palmer, Secretary.

Dr. W. D. Anderson has moved from Largo to Tarpon Springs.

Dr. R. H. Farringer, Hollywood, has moved to Hollywood Boulevard.

Dr. Sam J. Roberts, Miami, has moved to the Ingraham Building.

Dr. Francis H. Langley, St. Petersburg, was recently made a Fellow of the American College of Surgeons.

Dr. Spuler H. Etheredge and Miss Agnes L. Day, both of Tampa, were married recently.

Deaths

Dr. Cyrus Wallace Scott, St. Petersburg, aged 79, died recently of chronic myocarditis.

Dr. William Burton De Garmo, Coral Gables, aged 86, died January 3 as the result of a hip fracture received in a fall.

Dr. Frank Petty Hixon, Pensacola, aged 61, died January 4 of chronic myocarditis and cardiac decompensation.

Dr. Astus S. Magee, Pensacola, aged 57, died January 8 of malignant neoplasm of the bones.

Dr. Haynes Brinson, Kissimmee, aged 52, died January 7 of myocarditis.

Dr. William Henry Leslie, St. Petersburg, aged 67, died recently of coronary occlusion.

Dr. Earl H. McRae, Tampa, aged 49, died January 21.

Dr. Mary Freeman, Perrine, aged 68, died February 2 of injuries received in an automobile accident.

Dr. Herrman H. Harris, Jacksonville, aged 53, died January 20 from a heart attack.

GEORGIA

The Decatur-Seminole Counties Medical Society has elected the following officers for the coming year: Dr. E. C. Smith, Donalsonville, President; Dr. Thomas Chason, Donalsonville, Vice-President; Dr. M. A. Ehrlich, Bainbridge, Secretary-Treasurer.

The Glynn County Medical Society has elected the following officers for the coming year: Dr. J. W. Simmons, Brunswick, President; Dr. J. P. Harrell, Brunswick, Vice-President; Dr. T. V. Willis, Brunswick, Secretary-Treasurer.

The Muscogee County Medical Society has elected the following officers for the coming year: Dr. John E. Walker, Columbus, President; Dr. J. L. Spikes, Columbus, Vice-President; Dr. William C. Cook, Columbus, Secretary-Treasurer.

The Ware County Hospital, Waycross, elected the following officers for the coming year: Dr. W. R. Reavis, President; Dr. R. L. Johnson, Vice-President; Dr. A. W. DeLoach, Secretary-Treasurer.

The Crawford W. Long Memorial Hospital, Atlanta, has elected the following officers for the coming year: Dr. Harry W. Ridley, President; Dr. W. W. Daniel, Vice-President; Dr. C. E. Lawrence, Secretary.

The Georgia Baptist Hospital, Atlanta, elected the following officers for the coming year: Dr. C. C. Aven, President; Dr. W. S. Dorough, First Vice-President; Dr. Olin S. Cofer, Second Vice-President; Dr. Steven T. Brown, Secretary.

St. Joseph's Infirmary, Atlanta, has elected the following officers for the coming year: Dr. Murdock Equen, President; Dr. John W. Turner, Vice-President; Dr. Don F. Cathcart, Secretary-Treasurer.

Dr. Henry Grady Callison was recently made Health Commissioner of Augusta.

Dr. William A. Mulherin, Augusta, has been made Chairman of the Board of Health of that city.

Dr. Charles N. Wasden, Macon, was recently elected to Fellowship in the American College of Surgeons.

Dr. Charles W. Folsom, formerly Health Officer of Knox County, Kentucky, was recently appointed to a similar position in the Walker-Catoosa County Health Department to succeed Dr. Samuel P. Hall, Jr., resigned.

Dr. Edwin N. Maner, Savannah, has been elected President of the Health Center of Savannah.

Dr. Robert Frank Cary, Monticello, was recently elected Health Officer of Terrell County.

Dr. Charles A. Greer has been made Mayor of Oglethorpe.

Dr. Ford Ware, Macon, announces his removal to the Georgia Casualty Building.

Deaths

Dr. Edgar F. Fincher, Sr., Atlanta, aged 66, died January 7 of coronary sclerosis.

Dr. A. Pierce Kemp, Macon, aged 67, died January 13 of pneumonia.

Dr. Homer Augustus Wall, Ochlochnee, aged 67, died January 27 of heart disease.

Dr. James W. Anderson, Gray, aged 70, died January 3 of pneumonia.

KENTUCKY

The American College of Surgeons, Central Section, met in Louisville March 19-21.

The Grant County Medical Society has elected the following officers for the coming year: Dr. N. H. Ellis, Williamstown, President; Dr. J. T. Davis, Hardinsburg, Vice-President; Dr. C. A. Eckler, Dry Ridge, Secretary-Treasurer.

Dr. Clarence W. Rogers, Rineyville, and Mrs. Malinda Raine were married January 16.

Deaths

Dr. Charles Sturgill, Garrett, aged 49, died recently of heart disease.

Dr. Charles Felix Dale, Louisville, aged 53, died January 2 of pneumonia.

Dr. Solomon Crittenden Jones, Bailey's Switch, aged 66, died recently of heart disease.

Dr. L. K. Swango, Carlisle, aged 68, died recently of heart disease.

LOUISIANA

The Southeastern Surgical Congress held its annual meeting in New Orleans, March 9-11.

The American Congress of Physical Therapy, Southern Section, held its Spring Session at the Tulane University Medical School, New Orleans, on March 23 and 24.

The Southern Psychiatric Association met in New Orleans February 22-23 at the Hotel Roosevelt.

Dr. Louis Carroll Schuster and Miss Verna Mae Dill, both of New Orleans, were married recently.

Dr. Adolphe P. Delcourt, Hammond, and Miss Marion Weston were married recently.

Deaths

Dr. Daniel Oscar Willis, Leesville, aged 60, died December 23 of injuries received in an automobile accident.

Dr. Arthur R. Mattingly, New Orleans, aged 71, died recently of chronic myocarditis.

Dr. Edwin Harper Linfield, Alexandria, aged 39, died recently of injuries received in an automobile accident.

Dr. William Stowe Rutledge, Ruston, aged 54, died December 30 of injuries received when his car overturned.

Dr. George Pratt Garland, Eunice, aged 53, died recently of pneumonia.

MARYLAND

The Dorchester County Medical Society has elected the following officers for the coming year: Dr. J. Frederick Simmons, Cambridge, President; Dr. Frederick A. Miller, Cambridge, Vice-President; Dr. E. A. Jones, Cambridge, Secretary-Treasurer.

The Allegany-Garrett County Medical Society has elected the following officers for the coming year: Dr. Ralph C. Bowen, Cumberland, President; Dr. H. J. Bostetter, Mount Savage, Vice-

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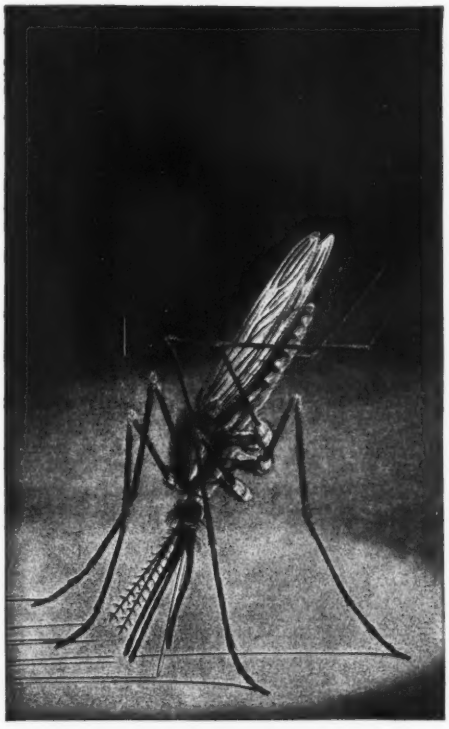

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Continued from page 444

President; Dr. Joseph P. Franklin, Cumberland, Secretary; Dr. Howard L. Tolson, Cumberland, Treasurer.

DEATHS

Dr. Egbert Laird Mortimore, Baltimore, aged 63, died January 5 of carcinoma of the colon.

MISSISSIPPI

Dr. R. M. Adams, Ripley, was named President-Elect of the Mid-South Postgraduate Medical Assembly at its meeting in Memphis recently.

The Adams County Medical Society has elected the following officers for the coming year: Dr. W. K. Stowers, Natchez, President; Dr. J. G. Logan, Natchez, Vice-President; Dr. F. S. Dixon, Natchez, Secretary-Treasurer.

The Clarksdale and Six Counties Medical Society has elected the following officers for the coming year: Dr. D. O. Pierce, Jonestown, President; Dr. J. L. Brookshire, Hushpuckena, Dr. I. P. Carr, Clarksdale, Dr. H. G. Johnson, Dundee, Dr. Fred Stone, Sledge, and Dr. J. A. Harris, Webb, Vice-Presidents; Dr. N. C. Knight, Clarksdale, Secretary-Treasurer.

The DeSoto County Medical Society has elected the following officers for the coming year: Dr. A. J. Weissinger, Hernando, President; Dr. J. M. Wright, Hernando, Vice-President; Dr. L. L. Minor, Memphis, Tennessee, Secretary-Treasurer.

The Issaquena-Sharkey-Warren Counties Medical Society has elected the following officers for the coming year: Dr. Thomas P. Sparks, Jr., Vicksburg, President; Dr. T. W. Huey, Grace, Dr. H. S. Goodman, Rolling Fork, and Dr. G. C. Jarrett, Vicksburg, Vice-Presidents; Dr. Leon S. Lippincott, Vicksburg, Secretary-Treasurer.

The Jackson County Hospital has elected the following officers for the coming year: Dr. A. P. McArthur, Moss Point, President; Dr. J. N. Thresh, Grand Bay, Alabama, Vice-President; Dr. R. G. Lander, Pascagoula, Secretary.

The Jackson County Medical Society has elected the following officers for the coming year: Dr. W. J. Weatherford, Pascagoula, President; Dr. H. M. Burnham, Moss Point, Vice-President; Dr. R. L. Lander, Pascagoula, Secretary-Treasurer.

The Newton County Medical Society has elected the following officers for the coming year: Dr. W. J. Pennington, Decatur, President; Dr. Z. C. Hagen, Union, Vice-President; Dr. Dudley Stennis, Newton, Secretary-Treasurer.

The Northeast Mississippi Thirteen County Medical Society has elected the following officers for the coming year: Dr. Z. A. Dorsey, Troy, President; Dr. R. P. Donaldson, Pontotoc, Vice-President; Dr. A. J. Stacy, Tupelo, Secretary.

The Pontotoc County Medical Society has elected the following officers for the coming year: Dr. L. O. Carruth, Tupelo, President; Dr. C. W. Patterson, Houlka, Vice-President; Dr. O. F. Carr, Pontotoc, Secretary-Treasurer.

Dr. Felix J. Underwood, Jackson, has been elected President of the State Social Workers' Conference.

The North Mississippi Medical Society had as guest speaker at a recent meeting Dr. James S. McLester, President, American Medical Association, Birmingham, Alabama.

Dr. H. G. Waldrop, formerly of Dumas, has moved to Caledonia.

DEATHS

Dr. Hiram Knox Butler, Summit, aged 88, died January 3 of hypertension and nephritis.

MISSOURI

The Missouri State Medical Association will hold its annual meeting in Columbia April 13-15.

The Boone County Medical Society has elected the following officers for the coming year: Dr. S. D. Smith, Columbia, President; Dr. R. S. Battersby, Columbia, Vice-President; Dr. M. E. Cooper, Columbia, Secretary.

The Cass County Medical Society has elected the following officers for the coming year: Dr. B. B. Tout, Archie, President; Dr. F. B. Ellis, Garden City, Vice-President; Dr. J. S. Triplett, Secretary-Treasurer.

The Cole County Medical Society has elected the following officers for the coming year: Dr. James Stewart, Jefferson City, President; Dr. John W. McHaney, Jefferson City, Vice-President; Dr. James A. Hill, Secretary-Treasurer.

The Dunklin County Medical Society has elected the following officers for the coming year: Dr. J. H. Keim, Kennet,

Continued on page 24

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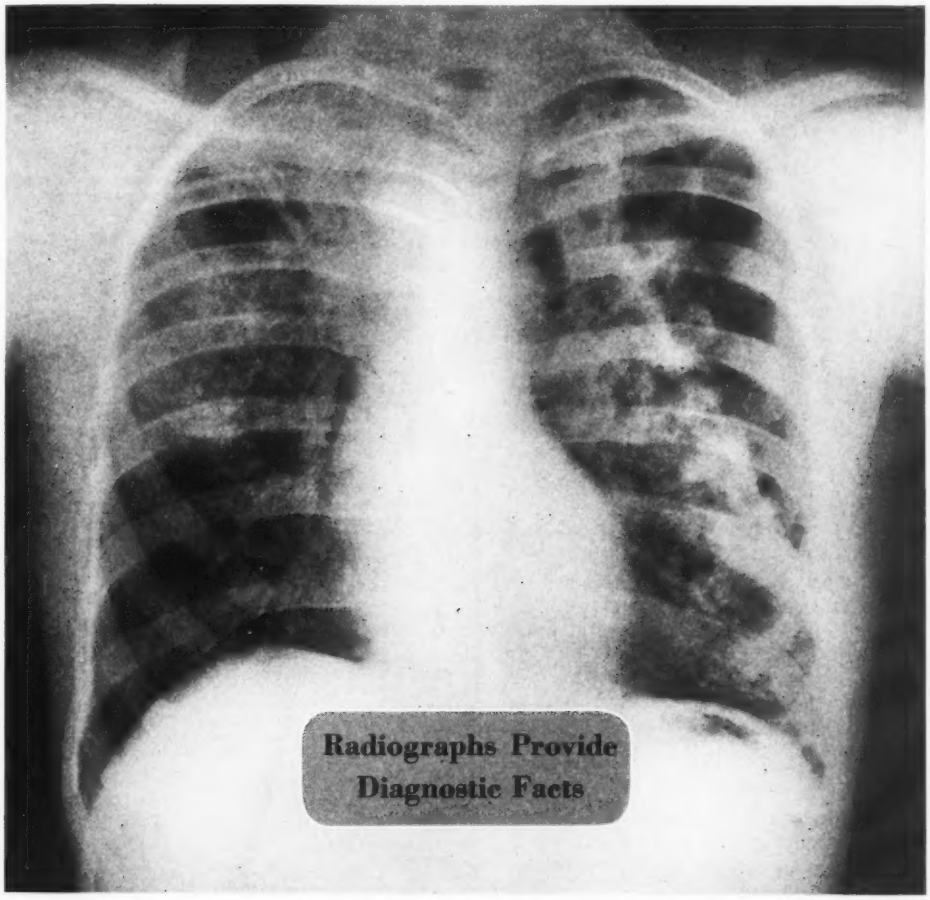

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Continued from page 22

President; Dr. W. D. English, Cardwell, Vice-President; Dr. T. J. Rigdon, Kennett, Secretary-Treasurer.

The Greene County Medical Society has elected the following officers for the coming year: Dr. R. F. Williams, Springfield, President; Dr. W. S. Sewell, Springfield, Vice-President; Dr. H. L. Hoover, Springfield, Secretary; Dr. J. F. Leslie, Springfield, Treasurer.

The Ste. Genevieve County Medical Society has elected the following officers for the coming year: Dr. G. M. Rutledge, Ste. Genevieve, President; Dr. J. A. Wilkins, St. Marys, Vice-President; Dr. J. A. Wilkins, St. Marys, Secretary-Treasurer.

The Scott County Medical Society has elected the following officers for the coming year: Dr. W. O. Finney, Chaffee, President; Dr. E. J. Nienstedt, Glodgett, Vice-President; Dr. U. P. Haw, Benton, Secretary.

The St. Joseph Hospital, Kansas City, has elected the following officers for the coming year: Dr. J. Park Neal, President; Dr. Buford G. Hamilton, Chief-of-Staff; Dr. Clarence A. McGuire, Vice-President; Dr. G. A. Roy, Secretary; Dr. Clarence S. Capell, Treasurer.

The Wesley Hospital, Kansas City, has elected the following officers for the coming year: Dr. Ralph R. Coffee, President; Dr. O. H. McCandless, Vice-President; Dr. A. Graham Asher, Secretary.

Dr. John McH. Dean, St. Louis, has been elected President of the St. Louis Surgical Society.

The Jackson and Wyandotte Counties Medical Societies, in joint session, had as guest speaker on February 11 Dr. Wheelan D. Sutliff, Chicago, Illinois.

DEATHS

Dr. Landon O. Rodes, Sikestown, aged 70, died recently of arteriosclerosis and coronary thrombosis.

Dr. George Gellhorn, St. Louis, aged 65, died January 25 of heart disease.

Dr. August Dutzi, St. Louis, aged 66, died January 23 of heart disease.

Dr. Horace Henry Hosford St. John, Edina, aged 84, died recently of valvular heart disease.

Dr. James P. Dougherty, St. Louis, aged 75, died recently of cerebral arteriosclerosis and bronchopneumonia.

Dr. Percy Joseph Farmer, St. Louis, aged 52, died January 23 of heart disease.

NORTH CAROLINA

The Baker Sanatorium, Lumberton, has elected the following officers for the coming year: Dr. K. M. Biggs, President of the Board; Dr. R. H. Livermore, Vice-President.

The Raleigh Academy of Medicine has elected the following officers for the coming year: Dr. Henry G. Turner, President; Dr. Charles P. Eldridge, Secretary; Dr. E. C. Judd, Treasurer.

Dr. Tom Sasser, Charlotte, announces his removal to the First National Bank Building.

Dr. Furman Yates Sorrell and Miss Julia L. Little, both of Wadesboro, were married recently.

DEATHS

Dr. Edward M. Bell, Mill Spring, aged 63, died January 17 of angina pectoris.

Dr. Clarence A. Flowers, Wendell, aged 54, died recently of acute dilatation of the heart.

Dr. Jacob Harrison Shuford, Hickory, aged 56, died January 15 of heart disease.

Dr. Alfred W. Howell, Cherryville, aged 78, died January 18.

OKLAHOMA

The Oklahoma State Medical Association will hold its annual meeting in Enid April 6-8.

Dr. E. L. Bagby, Vinita, has been made Superintendent of the Northeastern Oklahoma Hospital, Enid.

Dr. Floyd S. Newman, Shattuck, is at Tulane University in New Orleans taking postgraduate work.

Dr. L. S. Willour, McAlester, has returned after doing special orthopedic work in Memphis.

Dr. Henry H. Turner, Oklahoma City, was a recent speaker before the North Texas Medical Association in Dallas.

Dr. Gregory E. Stanbro, Oklahoma City, announces his removal to the Medical Arts Building.

Dr. M. S. Gregory, Oklahoma City, announces his removal to the Medical Arts Building.

Continued on page 26

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DEATHS

Dr. Joseph T. Clark, Tishomingo, aged 60, died recently of heart disease.

Dr. Millington Smith, Oklahoma City, aged 75, died January 9 of carcinomatosis.

Dr. Marcus K. McElhannon, Henryetta, aged 64, died recently.

Dr. Arley Ernest Carlock, Hartshorne, aged 63, died January 10.

Dr. T. J. Dodson, Norman, died January 11.

Dr. William James Risen, Hooker, aged 72, died January 18.

SOUTH CAROLINA

The Marlboro County Medical Society had as guest speakers at a recent meeting Dr. Roy B. McKnight, Charlotte, North Carolina, and Dr. Warren T. Vaughan, Richmond, Virginia.

Dr. Walter Grady Bishop, Greenwood, and Miss Martha Thurmond were married January 18.

Dr. S. R. Hickson, Fairfax, and Miss Dessie Strawborn were married February 14.

Dr. Samuel Eugene Miller, Charleston, and Miss Betty Barnwell were married March 10.

DEATHS

Dr. N. A. Jenkins, Columbia, aged 55, died recently of myeloid leukemia.

Dr. Joseph W. Eargle, Chapin, aged 88, died January 4 of pneumonia.

TENNESSEE

The Memphis Obstetrical and Gynecological Society has elected the following officers for the coming year: Dr. J. R. Reinberger, President; Dr. W. L. Williamson, Vice-President; Dr. J. P. Long, Treasurer; Dr. P. B. Russell, Secretary.

Dr. Eustace Sims, Memphis, was a guest speaker before the Fourth Councilor District Medical Society, Pine Bluff, Arkansas, recently.

Dr. Harrison Johnston Shull and Miss Margaret Cavert, both of Nashville, were married recently.

DEATHS

Dr. Fulton Thomas Ross, Kenton, aged 53, died December 14 of pneumonia.

Dr. Vincent A. Biggs, Martin, aged 76, died recently of cardiac asthma.

Dr. William Oliver Boyd, Nashville, aged 56, died January 12 of pneumonia.

Dr. Abraham Weatherly Boyd, Chattanooga, aged 75, died December 12.

Dr. William Franklin Skillern, Hixson, aged 77, died recently.

Dr. Edward A. Travis, Como, aged 75, died December 28 of bronchopneumonia.

Dr. George Baxter Poole, Nashville, aged 50, died January 1 of coronary thrombosis.

Dr. Robert Young Fisher, Parsons, aged 67, died December 30 of heart disease.

Dr. Joe Clifton, Memphis, aged 62, died January 26 of a heart attack.

Dr. J. J. Greer, Knoxville, aged 43, died January 12 of pneumonia.

Dr. John H. Revington, Chattanooga, aged 46, died January 27.

TEXAS

The Dallas Southern Clinical Society held its annual meeting March 16-19.

The Angelina County Medical Society has elected the following officers for the coming year: Dr. Wayne H. Taylor, Lufkin, President; Dr. J. C. Clement, Diboll, Vice-President; Dr. Joe S. Burch, Lufkin, Secretary-Treasurer.

The Bexar County Medical Society has elected the following officers for the coming year: Dr. H. O. Wyneken, San Antonio, President; Dr. Victor C. Tucker, San Antonio, Vice-President; Dr. George B. Cornick, San Antonio, Secretary; Dr. Harry McC. Johnson, San Antonio, Treasurer.

The Bosque County Medical Society has elected the following officers for the coming year: Dr. V. D. Goodall, Clifton, Presi-

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dent; Dr. A. N. Pike, Iredell, Vice-President; Dr. John E. Talley, Cranfill's Gap, Secretary.

The Brooks-Duval-Jim Wells Counties Medical Society has elected the following officers for the coming year: Dr. N. W. Atkinson, Alice, President; Dr. C. L. Behrns, Alice, Vice-President; Dr. George W. Wyche, Alice, Secretary-Treasurer.

The Childress-Collingsworth-Donley Hall Counties Medical Society has elected the following officers for the coming year: Dr. R. E. Clark, Memphis, President; Dr. F. A. White, Childress, Dr. J. W. Harper, Wellington, Dr. O. L. Jenkins, Clarendon, Dr. W. Wilson, Memphis, Vice-Presidents; Dr. Henry C. Wilson, Memphis, Secretary-Treasurer.

The Cooke County Medical Society has elected the following officers for the coming year: Dr. Jerry C. Price, Gainesville, President; Dr. Rufus C. Whiddon, Gainesville, Vice-President; Dr. O. E. Clements, Gainesville, Secretary-Treasurer.

The Denton County Medical Society has elected the following officers for the coming year: Dr. Jessie L. Herrick, Denton, President; Dr. Rebecca M. Evans, Denton, Vice-President; Dr. Austin D. Bates, Denton, Secretary-Treasurer.

The Grayson County Medical Society has elected the following officers for the coming year: Dr. E. L. Hailey, Denison, President; Dr. G. F. Brown, Sherman, Vice-President; Dr. E. F. Etter, Sherman, Secretary-Treasurer.

The Harris County Medical Society has elected the following officers for the coming year: Dr. M. B. Stokes, Houston, President; Dr. T. R. Hannon, Houston, Vice-President; Dr. Dean H. Kendall, Houston, Secretary; Dr. William A. Toland, Houston, Treasurer.

The Lamar County Medical Society has elected the following officers for the coming year: Dr. Ernest H. Start, Paris, President; Dr. O. R. O'Neil, Paris, Vice-President; Dr. D. F. Kerbow, Paris, Secretary.

The Lavaca County Medical Society has elected the following officers for the coming year: Dr. James W. Boyle, Jr., Shiner, President; Dr. E. H. Marek, Yoakum, Vice-President; Dr. Robert W. Williams, Shiner, Secretary-Treasurer.

The McLennan County Medical Society has elected the following officers for the coming year: Dr. R. Spencer Wood, Waco, President; Dr. J. C. Bradford, Mart, Vice-President; Dr. John L. Burgess, Waco, Secretary.

The Navarro County Medical Society has elected the following officers for the coming year: Dr. Fred W. Horn, Worthan, President; Dr. J. A. Jones, Corsicana, Vice-President; Dr. R. C. Curtis, Corsicana, Secretary-Treasurer.

The Neuces County Medical Society has elected the following officers for the coming year: Dr. N. T. Gibson, Robstown, President; Dr. Jerome Nast, Corpus Christi, Vice-President; Dr. W. L. Rhodes, Corpus Christi, Secretary.

The Palo Pinto County Medical Society has elected the following officers for the coming year: Dr. R. H. Smith, Palo Pinto, President; Dr. A. J. Evans, Mineral Wells, Vice-President; Dr. J. Edward Johnson, Mineral Wells, Secretary.

The Polk-San Jacinto Counties Medical Society has elected the following officers for the coming year: Dr. J. R. Towns, Camden, President; Dr. Ivison Grimes, New Willard, Vice-President; Dr. J. H. Dameron, Livingston, Secretary-Treasurer.

The Taylor-Jones Counties Medical Society has elected the following officers for the coming year: Dr. B. F. Rhodes, Abilene, President; Dr. L. M. Metz, Stamford, Vice-President; Dr. J. Frank Clark, Abilene, Secretary-Treasurer.

The Victoria-Calhoun Counties Medical Society has elected the following officers for the coming year: Dr. Heaton Smith,

Continued on page 30

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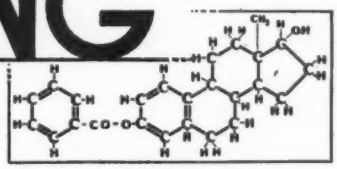

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Victoria, President; Dr. J. V. Hopkins, Victoria, Vice-President; Dr. R. S. Lander, Victoria, Secretary-Treasurer.

The Washington County Medical Society has elected the following officers for the coming year: Dr. G. A. L. Kusch, Gay Hill, President; Dr. Robert A. Hasskarl, Brenham, Vice-President; Dr. Arthur Becker, Brenham, Secretary-Treasurer.

Dr. Roy T. Goodwin, San Antonio, has been elected President of the Southwest Texas District Medical Society.

The Dallas Methodist Hospital Staff has elected the following officers for the coming year: Dr. R. H. Millwee, President; Dr. Edgar Loomis, Vice-President; Dr. L. C. Sams, Secretary.

The Hotel Dieu Hospital Staff, Beaumont, has elected the following officers for the coming year: Dr. D. P. Harris, President; Dr. W. H. Brandau, Vice-President; Dr. Lamar C. Bevil, Secretary-Treasurer.

The St. Mary Gates Memorial Hospital Staff has elected the following officers for the coming year: Dr. Durman H. Tyner, President; Dr. I. T. Young, Vice-President; Dr. B. J. Fett, Secretary-Treasurer.

The South Texas Postgraduate Medical Assembly has elected the following officers for the coming year: Dr. C. C. Cody, Houston, President; Dr. F. R. Winn, Alvin, Vice-President; Dr. Herbert Hayes, Houston, Secretary; Dr. J. Harolde Turner, Houston, Treasurer.

Dr. Wiley C. Morrow, Greenville, was recently appointed to the State Board of Medical Examiners, succeeding the late Dr. Herman H. Blankmeyer.

Dr. David T. Bundy, Tyler, has been made Health Officer of Smith County to succeed the late Dr. Benjamin T. Bryant.

Dr. E. W. Bertner, Houston, has been made Chief of Staff of Herman Hospital.

The North Texas Medical Association had as guest speaker at a recent meeting Dr. Henry H. Turner, Oklahoma City, Oklahoma.

Dr. W. F. Birdsong has moved from Fort Worth to Texon.

Dr. Thomas M. Jeter has moved from Fort Worth to Terrell.

Dr. J. S. McCreary has moved from Shamrock to McLean.

Dr. T. A. Moore has moved from Jermyn to Wichita Falls.

Dr. N. T. Mulloy has moved from Monahans to Post.

Dr. Gordon Phillips has moved from Henrietta to Haskell.

Dr. A. J. Sharp has moved from Franklin to Terrell.

Dr. Bernard H. Bayer, Houston, and Miss Rebecca Miller were married recently.

Dr. Lloyd B. Sheffield, Dallas, and Miss Katie Pearl Reynolds were married recently.

Deaths

Dr. Ira Edwin Durant, San Antonio, aged 64, died recently.

Dr. Joseph H. Schnell, Houston, aged 85, died December 13 of cerebral hemorrhage, chronic nephritis and arteriosclerosis.

Dr. Charles Sledge Coker, Crosby, aged 76, died December 19 of hypertensive heart disease, nephritis and bronchopneumonia.

Dr. William Compton Harris, Houston, aged 65, died December 13 of chronic myocarditis and hypertension.

Dr. Adam M. Autrey, Houston, aged 72, died December 28 of hypostatic pneumonia.

Dr. Jeffrey Charles Michael, Houston, aged 47, died January 21 as the result of a fall from a window.

Dr. B. T. Bryant, Tyler, aged 68, died January 9 of heart disease.

Dr. Louis Wesley Watkins, Leonard, aged 60, died January 5.

VIRGINIA

The Southside Virginia Medical Association, at its meeting in Petersburg March 10, elected the following officers for the coming year: Dr. L. S. Early, Petersburg, President; Dr. G. M. Naff, Emporia, Dr. Leta White, Petersburg, Dr. O. R. Yates, Suffolk, Dr. J. A. Grizzard, Drewryville, Vice-Presidents; Dr. R. L. Raiford, Franklin, Secretary-Treasurer.

The Lee County Medical Society has elected the following officers for the coming year: Dr. C. S. Gresham, St. Charles, President; Dr. J. B. Muncy, Pennington Gap, Secretary-Treasurer.

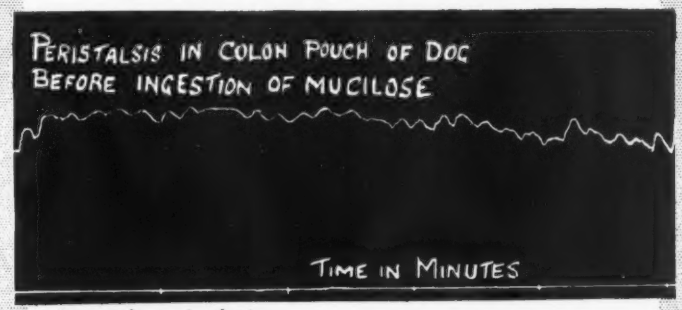
The Neuropsychiatric Society of Virginia has elected the following officers for the coming year: Dr. David C. Wilson, University, President; Dr. R. Finley Gayle, Richmond, Vice-President; Dr. Frank H. Redwood, Norfolk, Secretary-Treasurer.

Dr. Will R. Williams, Richlands, has been appointed to the State Board of Health, succeeding Dr. Joseph A. McGuire, Norton, deceased.

Dr. Linwood Farley, Ashland, has been made Health Officer of Hanover County.

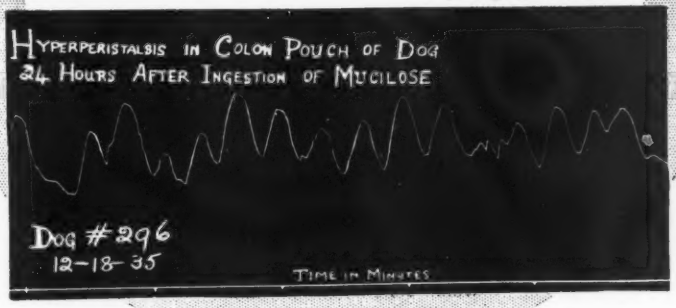
Continued on page 32

NORMAL PERISTALSIS
STIMULATED BY
DISTENTION



1. Kymographic tracing showing contractions without Mucilose.

2. Contractions 24 hours after feeding with Mucilose.



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with Portability
and these exclusive features:
• Calibration 260 or 300 mm.
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STANDARD FOR BLOODPRESSURE
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SINCE 1916 ORIGINATORS AND MAKERS OF BLOODPRESSURE APPARATUS EXCLUSIVELY

Continued from page 30

Dr. John W. Bowdoin, Bloxom, has been made Superintendent of Public Welfare of Accomac County.

Dr. J. R. Tucker, Williamsburg, has been named to serve on the Health Committee of that city.

Dr. Fred J. Wampler, Richmond, was recently appointed Medical Advisor for the Works Progress Administration of Virginia.

Dr. Grant Van Huysen recently joined the Staff of the Medical College of Virginia, Richmond, as Associate in Anatomy.

Dr. Harold Walter Potter, Newport News, Dr. Wyndham Bolling Blanton and Dr. Douglas Gordon Chapman, Richmond, have been elected to Fellowship in the American College of Physicians.

The University of Virginia Medical Society had as guest speaker at a recent meeting Dr. W. C. Spain, New York.

The Medical College of Virginia, Richmond, had as guest speaker recently Dr. L. R. Broster, Chief Surgeon of the Charing Cross Hospital, London.

Dr. John E. Gardner, Roanoke, has returned after taking postgraduate work in Philadelphia, Pennsylvania.

Dr. W. N. Breckinridge, Fincastle, was recently made President of the Botetourt County Fair Association.

Dr. W. S. Whitmore, Staunton, has been made President of the Shenandoah Game and Game Fish Protective Association.

Dr. William R. Weisiger, Richmond, has been made District Deputy Grand Master of the Fifteenth Masonic District.

Dr. Sam Silver, formerly of Lynchburg, is now located at Slate Run, Pennsylvania.

Dr. J. Paul Kent, formerly of Roanoke, has moved to Altavista.

Dr. T. Stanley Meade, Richmond, has opened offices on Floyd Avenue.

Dr. Emmett Carlysle Matthews, Waynesboro, and Miss Mary Hodnett were married February 7.

Dr. Francis Henry McGovern, Danville, and Miss Rebecca Cash Lee were married February 7.

Dr. Bernard Showalter, Kenbridge, and Miss Edna Elizabeth Keily were married recently.

Dr. Charles Walton Purcell, Charlottesville, and Miss Cleo Virginia Ashby were married January 18.

Dr. John Gordon Bell, Covington, and Miss Anna Lee Paschall were married recently.

Continued on page 34

AMENORRHEA

SCANTY MENSTRUATION

When menstruation fails to appear or is scanty and irregular and associated with low metabolism, obesity or hypothyroidism, prescribe

BOXES OF 100 TABLETS

G. W. CARNRICK CO.

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CONSIDER THE RADISH!

IT arrives in the Spring along with the succulent green onion and fresh garden lettuce. Unfortunately, Spring's contributions to the family table frequently carry organisms which cause diarrhea.

As in cases of "ptomaine poisoning", simple or infectious colitis, Kaomagma adsorbs bacterial toxins and products of putrefaction, soothes the inflamed mucosa, promptly consolidates liquid feces and reduces too frequent stools to normal.

Kaomagma is an emulsoid of finest medicinal kaolin activated by fluid dispersion in Alumina Gel. Kaomagma Plain and Kaomagma with Mineral Oil are available in 12-ounce bottles at your prescription pharmacy . . .

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First Aid in Whooping Cough

ELIXIR BROMAURATE

Is giving excellent therapeutic results in

Whooping Cough

- **ELIXIR BROMAURATE** cuts short the duration of the illness, reduces the frequency of the attacks, relieves the distressing cough and gives the child rest and sleep.
- **ELIXIR BROMAURATE** is prescribed routinely by experienced physicians in all COUGH DISORDERS. Also valuable in the cough of PULMONARY TUBERCULOSIS and in BRONCHITIS and BRONCHIAL ASTHMA. Neurologists are using the Elixir with good effect in CHOREA, MIGRAINE and PETIT-MAL.
- **ELIXIR BROMAURATE** is a standard, assayed and palatable preparation. In four-ounce original bottles; the dosage is a teaspoonful 3 to 4 times a day after meals or more often when necessary.

GOLD—An interesting booklet on "Gold in the Treatment of Whooping Cough and Other Diseases" may be had on request. Drop us a card.

GOLD PHARMACAL CO., New York

Continued from page 32

Dr. George Louis Jones, Ridgeway, and Miss Ruth Margaret Wilson were married December 14.

DEATHS

Dr. Carlton Lee Starkweather, Occoquan, aged 71, died recently of heart disease.

Dr. Southgate Leigh, Norfolk, aged 69, died March 5 of cerebral hemorrhage.

Dr. Willcox Ruffin, Norfolk, aged 35, died February 28.

Dr. Charles P. Smith, Martinsville, aged 75, died January 17.

Dr. Thomas W. Edmunds, Danville, aged 50, died February 1 of pneumonia.

WEST VIRGINIA

The Marion County Medical Society elected the following officers for the coming year: Dr. J. B. Clinton, Fairmont, President; Dr. C. L. Parks, Fairmont, Vice-President; Dr. A. H. Stevens, Fairmont, Secretary; Dr. C. W. Waddell, Treasurer.

The Wyoming County Medical Society has elected the following officers for the coming year: Dr. F. H. Penn, Coval, President; Dr. T. R. Coleman, East Gulf, Vice-President; Dr. Ward Wylie, Mullens, Secretary-Treasurer.

The Ohio County Medical Society had as guest speaker at a recent meeting Dr. William Rienhoff, Johns Hopkins Hospital, Baltimore, Maryland.

The Parkersburg Academy of Medicine had as guest speaker at a recent meeting Dr. John A. Kolmer, Philadelphia, Pennsylvania.

The Harrison County Medical Society had as guest speaker at a recent meeting Dr. C. C. Coleman, Richmond, Virginia.

Dr. Rodolph Fowlkes, Welch, and Miss Rinda Elizabeth Gay were married recently.

DEATHS

Dr. Constantine Clinton Barnett, Huntington, aged 66, died December 29 of hypertensive heart disease.

Dr. William F. Stewart, New Martinsville, aged 76, died December 27 of mitral stenosis and chronic pulmonary tuberculosis.

"Ciba"
Vioform is issued in sprinkler-top cans and in bottles of ½ ounce and 1 pound.
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VIOFORM
ACTS EFFECTIVELY
ENDAMEBA HISTOLYTICA
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Leake[1] reports favorable response in average cases of human amebiasis with Vioform—iodochloroxyquinoline—given orally in two courses.
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Vioform as a dusting powder surpasses iodoform in antiseptic activity and freedom from unpleasant odor.
1. Leake, et al., J. A. M. A., May 27, 1933
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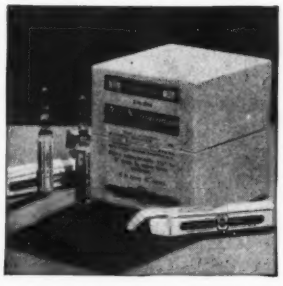

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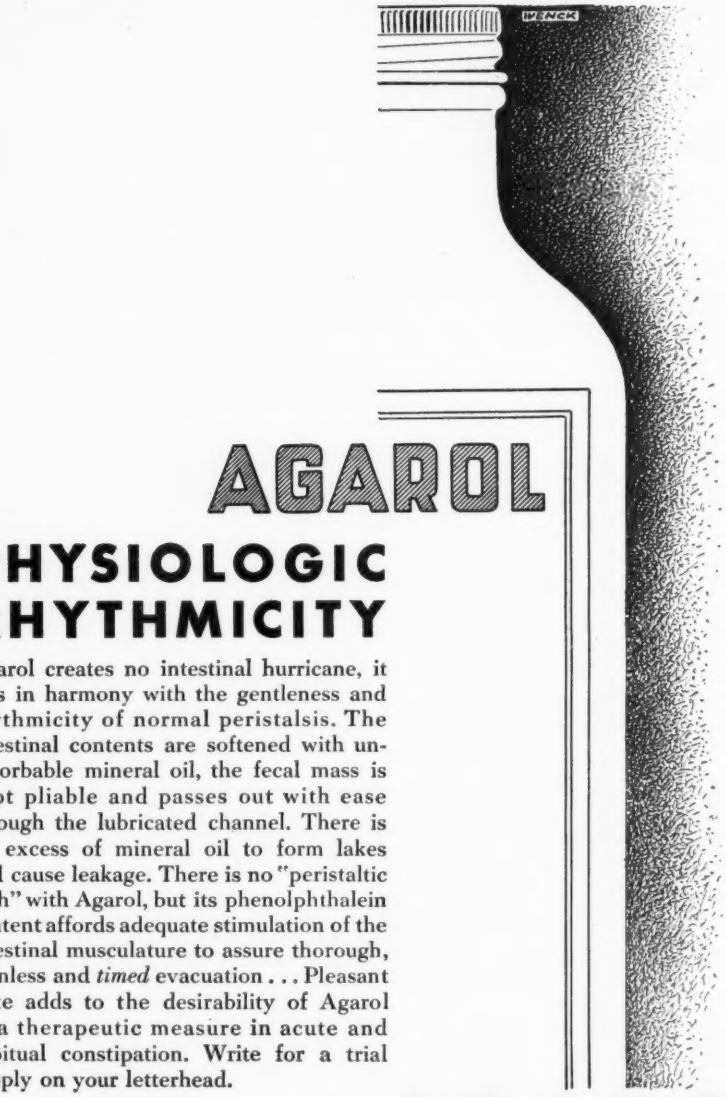

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AGAROL

Bottles of 6, 10 and 16 ounces. Average dose is one tablespoonful.

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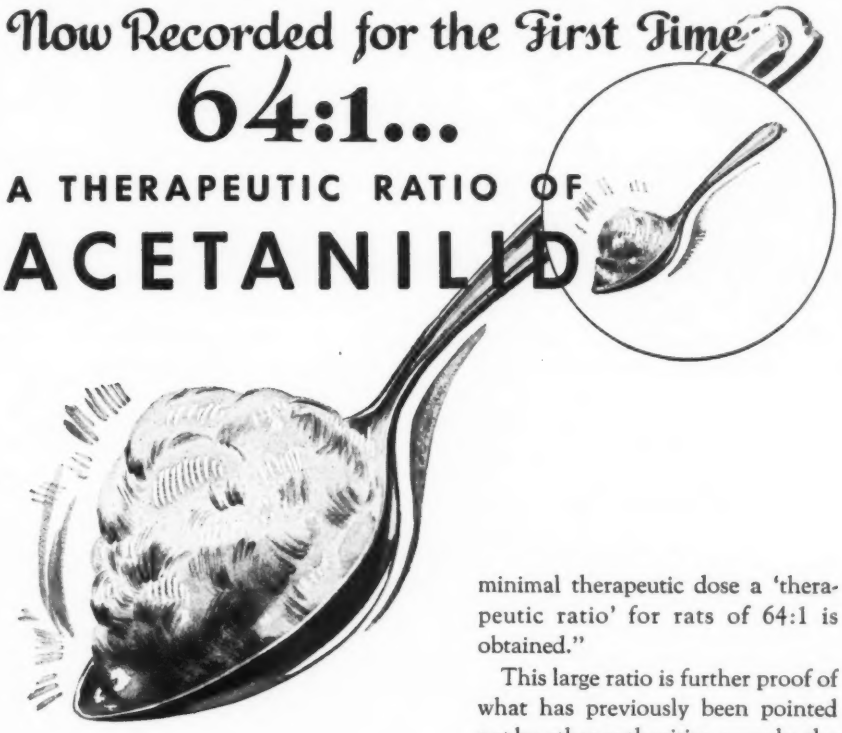

"STUDIES of the antipyretic activity and toxicity of acetanilid in the same species of animal have not heretofore been recorded," say Smith and Hambourger*. These investigators gave acetanilid to rats made febrile by subcutaneous injections of yeast, and observed that the average minimum dose producing fall in temperature was 12.5 mg. per kilogram. Fatal doses averaged 800 mg. per kilogram.

They conclude:—"By dividing the 'fatal dose' of acetanilid by the minimal therapeutic dose a 'therapeutic ratio' for rats of 64:1 is obtained."

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**P. K. Smith & W. E. Hambourger, J. Pharm. & Exp. Ther., July, 1935, p. 346.*

EMERSON DRUG COMPANY, BALTIMORE, MD.

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Rich in Natural Vitamins A and D

Mead's Oleum Percomorphum makes it possible to prescribe natural vitamins A and D in the same ratio as they occur in cod liver oil* — but in drops dosage rather than in teaspoonfuls. Consisting of equal volumes of percomorph liver oil and cod liver oil, this product is so potent that it can be given in 1/100 the dosage of cod liver oil.* Each gram supplies not less than 60,000 vitamin A units and 8,500 vitamin D units (U. S. P.).

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Realizing that physicians are accustomed to the decimal system, we have blended Mead's Oleum Percomorphum to a potency 100 times that of U. S. P. cod liver oil, which has a vitamin A content of 600 units and a vitamin D content of 85 units. For physicians who prefer cod liver oil we have also prepared Mead's Cod Liver Oil Fortified With Percomorph Liver Oil (5% percomorph liver oil) having a vitamin content 10 times cod liver oil.* Thus the physician can conveniently prescribe vitamins A and D in any required dosage, in convenient ratio to an acceptable standard cod liver oil.

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Mapharsen permits treatment of syphilis with small doses of arsenic.

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